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THE
MARINERS
NEW KALENDAR.

Containing

The Principles of Arithmetick and Geometry; with
the Extraction of the Square and Cube Roots. Alſo
Rules for finding the Prime, Epact, Moon's Age,
Time of High-Water, with Tables for the ſame.

Together with

Exact Tables of the Sun's Place, Declination, and Right-Aſcenſion. Of the Right Aſcenſion and Declination of the
Principal Fixed Stars. Of the Latitude and Longitude of
Places. A large Table of Difference of Latitude and Departure, for the exact Working a Traverſe.

ALSO

The Deſcription and Uſe of the Sea-Quadrant, Fore-Staff
and Nocturnal. The Problems of Plain-Sailing and Aſtronomy, wrought by the Logarithms, and by *Gunter's* Scale.
A Tide Table. The Courſes and Diſtances on the Coaſt
of *Great Britain*, *Ireland*, *France*, &c. And the Soundings
coming into the Channel. With Directions for ſailing into
ſome Principal Harbours.

BY

NATHANIEL COLSON, *Student in the Mathematicks*

London, Printed for *William Mount* and *Thomas Page*, on
Tower-Hill, 1742.
Where you may have all Sorts of Mathematical Books.

To the Ingenious *Mariner*.

I Here preſent thee with a *New Kalendar*, wherein I have endeavoured, not to puzzle thee with unprofitable Problems, (a Thing too much practiſed) but to make Things plain and practicable. Here is nothing obſcure or difficult to diſcourage young Beginners (for whom 'tis intended) but all Things treated of with as much Plainneſs (both of Matter and Method) as poſſible; and I aſſure thee were I preſent to inſtruct thee, I could by no means render things more intelligible than I have here done. I have endeavoured to omit nothing that might be materially uſeful, having reſpect to the deſign'd bigneſs of the Volume. The *Contents* are as follow:

The Principles of *Arithmetick*, with which I begin, becauſe I am ſenſible of the Loſs ſome have been at, that have attempted *Navigation* before they have underſtood ſomething of it; the *Extraction of the Square and Cube Roots:* In all which I have endeavoured to apply the Examples to Sea Affairs. Some neceſſary *Geometrical Problems*, uſeful in *Navigation*. Directions for finding the *Prime*, *Epact*, *Moon's Age*, and the *Time of Full Sea* (both according to the ordinary and a more accurate Way) with *Tables* for the ſame.

Tables of the Sun's Place and Declination, with Directions and Examples to every Caſe, how to uſe the Declination to find the Latitude: As alſo the neceſſary Tables for correcting the Declination, when the Difference of Longitude is conſiderable from the Meridian of *London*, for which the ſaid Tables of Declination are calculated. A Table of the Sun's Right Aſcenſion. A Table of the Right Aſcenſion and Declination of ſome of the principal fixed Stars, with the uſe of the ſaid Tables in finding the time of a Stars coming to the Meridian; as alſo Directions at large for Obſervation of any of the ſaid Stars to find the Latitude of the Place, with Examples in each Caſe. The Deſcription of the *Sea-Quadrant*, *Fore-ſtaff* or *Nocturnal*. A Table of Latitude and Longitude of the principal Places on the Sea-Coaſt, collected from the beſt Information. Problems of *Plain Sailing* and *Aſtronomy*, (which that the *Practitioners* might learn two things at once) are wrought both by the *Logarithms*, and *Gunter*'s Scale. A large and very uſeful Table of Difference of *Latitude* and *Departure* to every Degree and Quarter Point of the Compaſs: With its uſe in working a Traverſe in order to keep a Reckoning at Sea. A *Rutter* for the Coaſt of *Great-Britain*, *France*, *Ireland*, *Spain*, *Portugal*, &c Shewing the Bearing and Diſtance from one Place to another A Table of the *Soundings* coming into the *Channel*, giving the Depth of Water, and Quality of the Ground. Laſtly, Directions for ſailing into ſome principal Harbours. By all, or any of which, if thou art any ways profited (as I know thou mayeſt, if thou wanteſt Information in any of theſe Things, and doſt but a little carefully animadvert upon what thou readeſt) I have my End: And thy kind Acceptance hereof will further oblige me,

Who am thy Friend,

Nathaniel Colſon.

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The Principles of Arithmetick briefly and plainly demonſtrated, with the Extraction of the Square and Cube Roots.

BECAUSE of the Uſefulneſs and Neceſſity of ſome Knowledge of *Arithmetick*, in the Art of *Navigation*, it is requiſite to begin with that, without which no orderly Procedure can be made, and firſt of

Numeration.

NUmeration is that part of *Arithmetick*, whereby one may rightly expreſs the Value of any Number propoſed.

All *Numbers* are expreſſed by theſe Characters following.

1,	2,	3,	4,	5,	6,	7,	8,	9,	0,
One,	*Two*,	*Three*,	*Four*,	*Five*,	*Six*,	*Seven*,	*Eight*,	*Nine*,	*Cypher*

Altho' Cyphers ſignify nothing by themſelves, yet being put before (or to the Right Hand of) other Figures, they increaſe their Value as much as if they were all Figures, as may plainly be ſeen in the Table following.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thouſands	1000
12345	X Thouſands	10000
123456	C Thouſands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their Value according to their Places they are ſet in, as 1 in the firſt Place, or Place of *Units*, is *One*; in the ſecond Place *Ten*; in the third Place *One Hundred*; in the fourth Place *One Thouſand*; in the fifth Place *Ten Thouſand*, &c.

The Table directs how properly to expreſs any given *Number*; As 123, which *Number* conſiſting of three Places, is thus numbred, *One Hundred Twenty Three*; this *Number* 123456, conſiſting of ſix Places, is thus expreſſed, *One Hundred, Twenty Three Thouſand, Four Hundred fifty ſix*; and this *Number* 123456789, conſiſting of nine Places, is thus numbred, *One Hundred twenty three Millions, Four Hundred Fifty ſix Thouſand, Seven Hundred Eighty Nine.*

ADDITION.

ADdition is that which of ſeveral Sums makes but one Sum.

Example. Suppoſe four Men (A. B. C. D.) owe me ſeveral Sums of Money, I would know how much is due to me in the whole: I begin at the firſt Row towards the Right Hand and ſay, 3 and 6 is 9 and 2 is 11, and 4 is 15; ſetting down the 5 under the Row added up; then I carry the 1 ten to the next Row, ſaying 1 and 4 is 5, and 5 is 10, and 3 is 13, and 6 is 19; ſet down 9 under the Row added up, and carry one to the next row, ſaying, 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; ſet down 9 and carry 1, which 1 and 1 is 2, and 3 is 5, and 5 is 10, and 3 is 13, which becauſe this is the firſt row, I ſet down: So that by this *Addition*, the whole Debt is found to be *Thirteen Thouſand, Nine Hundred, Ninety five Pounds.*

A	oweth	3564
B	—	5432
C	—	3156
D		1843
		13995

Characters uſed in Arithmetick.

l.	Pounds.
s.	Shillings.
d.	Pence.
°	Degrees.
′	Minutes.
″	Seconds.

Examp. 2. Suppoſe I have ſeveral Creditors to whom I owe ſeveral Sums of Money, I deſire to know the whole

Therefore begin again (as always in *Addition*) at the Right-hand, I ſay 11 and 10 is 21, and 4 is 25, and 6 is 31; now conſidering how many Shillings there are in 31*d.* I find 2*s.* and 7*d.* wherefore I ſet down the odd 7*d.* under the row of Pence, and carry the 2*s.* to the next row being Shillings, ſaying 2 and 4 is 6, and 8 is 14, and 9 is 23; and 11 is 34, that is 1*l.* 14*s.* ſet down 14*s.* and carry the 1*l.* to the next row, ſaying, 1 and 3 is 4, and 6 is 10, and 5 is 15, and 3 is 18; ſet down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; ſet down 2 and carry 1: Laſtly, 1 and 1 is 2; ſo that by this *Addition* the whole Debt is, *Two Hundred Twenty Eight Pounds, Fourteen Shillings and Seven Pence.*

l.	*s.*	*d.*
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

Examp. 3. Suppoſe at Sea, keeping my Reckoning in Degrees and Minutes, having ſix Days Difference of Longitude. I would know how much the whole is.

Say 13 and 2 is 15, and 9 is 24, and 56 is 80 and 6 is 86; now 60 Minutes making a Degree, ſet down the odd 26 Minutes under the row of Minutes, and carry the 1 Degree to the next row, being Degrees; ſaying 1 that I carry'd and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7; ſo that the whole Difference of Longitude made theſe 6 Days, is 7 Degrees and 26 Minutes.

		°	′
1	Day	1	06
2	—	0	56
3	—	1	09
4	—	2	00
5	—	1	02
6	—	1	13
0		7	26

Subtraction is the taking of a leſs Sum out of a greater, and finding the Remainder

	l.	*s.*	*d.*
Example. Suppoſe a Man oweth me ————	376	13	06
And hath paid me ————	211	05	08
I deſire to know what remains unpaid, which is ——	165	07	10

To work this I ſay, 8 from 6 I cannot, but conſidering there is 12 Pence contained in a Shilling, I add, 12 to 6, and ſay 8 from 18, and there remains 10, which ſet down under the Pence; and then having borrowed 1 I go to the next Row, and ſay; 1 that I borrowed and 5 is 6, which take out of 13, there remains 7; then proceeding to the Pounds, I ſay, 1 from 6 there remains 5, and 1 from 7 there remains 6; and laſtly, 2 from 3, there remains 1: ſo there remains due of the ſaid Debt, *One Hundred Sixty Five Pounds, Seven Shillings, Ten Pence.*

Example 2. Suppoſe the Diſtance between two Places to be 1000 Miles, and that I have ſailed 396, and deſire to know how many Miles I have to Sail.

Therefore placing 396, under the 1000, I ſay, 6 from 0 I cannot, but 6 from 10, there remains 4; proceeding to the next Figure I ſay, 1 that I borrowed and 9 is 10, from 0 I cannot, but 10 from 10 there remains 0: Again, 1 that I borrowed and 3 is 4, from 0 I cannot; but 4 from 10, there remains 6: Laſtly, 1 that I borrowed from 1, there remains 0: So there remains 604 Miles.

Miles,
1000
396
604

Example 3. Suppoſe one Place in the Latitude of 51 Deg. 32 Min. and another in the Latitude of 42 Deg. 10 Min. I would know the Difference of Latitude between them.

To do which, ſubtract the leſs Latitude out of the greater thus; the leſſer being placed undermoſt, ſay, 10 from 32, there remains 22, which Place under the Minutes; then for the Degrees, 2 from 1 I cannot, but 2 from 11 there remains 9, then 1 that I borrowed, and 4 is 5, 5 from 5 there remains 0.

°	′
51	32
42	10
9	22

So the Difference of Latitude is 9 Deg. 22 Min.

Multiplication.

Multiplication is that which ſerves inſtead of many Additions, by which any Number of a greater Denomination is brought into a leſs, as Pounds into Shillings, and Shillings into Pence, and Pence into Farthings, Degrees into Minutes, Minutes into Seconds, and the like; which is done by multiplying the Number of the greater Denomination, by the Number of the leſſer which is contained in the greater, as the multiplying any Number of Pounds by 20 (the Number of Shillings contain'd in a Pound) brings it into Shillings, and ſo of the reſt.

Multiplication conſiſts of Three Parts

1. The Multiplicand, or Number to be multiplyed
2. Multiplier, or Number by which to multiply
3. The Product made by the Multiplication.

For the Learner's more ready Procedure herein, it is neceſſary to inſert the Table which is firſt to be committed to Memory.

The

The Multiplication TABLE.

2 times	2	is	4
	3		6
	4		8
	5		10
	6		12
	7		14
	8		16
	9		18
3 times	3	is	9
	4		12
	5		15
	6		18
	7		21
	8		24
	9		27
4 times	4	is	16
	5		20
	6		24
	7		28
	8		32
	9		36
5 times	5	is	25
	6		30
	7		35
	8		40
	9		45
6 times	6	is	36
	7		42
	8		48
	9		54
7 times	7	is	49
	8		56
	9		63
8 times	8	is	64
	9		72
9 times	9	is	81
10 times	10	is	100

Example 1. I demand how many Shillings there is in 5648 *l.*

To Anſwer this, multiply the given Number of Pounds by 20, Thus; The firſt being 0 Cypher, ſet down 0 underneath the firſt Figure; and then proceed to the next Figure, and ſay, 2 times 8 is 16; ſet down 6 under the ſecond Figure and carry 1; then 2 times 4 is 8, and 1 that I carried makes 9; then 2 times 6 is 12, ſet down 2, and carry 1; laſtly, 2 times 5 is 10, and 1 that I carried makes 11. So that 5648 *l.* multiply'd by 20, makes 112960 Shillings.

```
     l.
   5648
     20
 ------
 112960
 ------
```

Example 2. In 276 Degrees how many Minutes?

First ſet down —————————————— 276

Then (becauſe 60 Minutes make a Degree) multiply by ———— 60

The Product is —————————————— 16560

So that I find 276 Degrees multiplied by 60, makes 16560 Minutes.

```
Example. 3. Multiply —— 8765437        Multiply —— 47632867
By ——————————————————— 32              By ——————— 4352
                 ---------                     ------------
                  17530874                     95265734
                 26296311                     238164335
                 ---------                   142898601
Product —————————— 280493984                190531468
                                           ------------
                                           207298237184
                                           ------------
```

DIVISION.

Diviſion is that which ſerves in the Room of many *Subtractions* and is uſeful in reducing all Numbers of a leſſer Denomination into a greater, as Minute into Degrees, Farthings into Pence, Pence into Shillings, and Shillings into Pounds. It conſiſts of Three Parts, (*viz.*) *Dividend* or the

Number to be divided; Diviſor, or the Number to divide by; and the Quotient, alſo if any Number remain, it is called the Remainder.

Diviſor. Dividend. Quotient.
23) 7834 (340
69
93
92
14 Remainder

Ex. 1. To divide 7834 by 23; firſt ſay, how many times 2 in 7: Or, how often 23 in 78, the Anſwer will be 3 times, which place in the Quotient, then multiply the Diviſor 23 by 3, the Figure placed in the Quotient, ſaying, 3 times 3 is 9, and 3 times 2 is 6, and place theſe under the two firſt Figures of the Dividend, and draw a Line; ſubtracting 69 from 78, there reſts 9, which ſet underneath, and place a Point under 3, to ſhew that it's brought down; place it to the 9, then proceed, ſaying, how many times 23 in 93, or how many times 2 in 9: which will be 4 times; place 4 in the Quotient, by which multiply the Diviſor: Again, placing the Product which is 92 under 93, and draw a Line, and ſubtract it therefrom, the Remainder 1 put under the Line, and ſet down 4 the laſt Figure in the Dividend, putting a Point under it, and place it to the remaining 1: then becauſe there remains but 14, being leſs than the Diviſor 23, and ſo cannot be taken out of it, place a Cypher in the Quotient, and the Work is finiſhed.

Diviſor. Dividend. Quotient.
6|0) 36|0 (6
36
00

Ex. 2. In 360 Minutes how many Degrees? Here I divide by 60, becauſe 60 Minutes make a Degree, and becauſe the laſt Figure of the Diviſor is a Cypher, I cut it off, and with it the laſt Figure of the Dividend, which is here alſo a Cypher, and divide 36 by 6, (which is the ſame thing as to divide 360 by 60) but becauſe 6 cannot be taken out of 3, therefore I ſay, how many times 6 in 36? The Anſwer is 6 times: which I place in the Quotient, and proceed to multiply the Diviſor 6, by the 6 placed in the Quotient, which produceth 36, which ſubtracted leaves 0, ſo that by this Work it appears, that in 360 Minutes there are 6 Degrees juſt.

Example 3. A Ship taken by 253 Men, is valued at 59875 *l.* I demand each Man's Share, being equally divided.

Diviſor. Dividend. Quotient.
253) 59875 (236
506
927
759
1685
1518
167 Remains

253
236
1518
759
506
167
Proof 59875

Firſt, ſay, how many times 2 in 5? The Anſwer is two times, which place in the Quotient; then multiply the Diviſor 253 by 2, the Figure placed in the Quotient, ſaying 2 times 3 is 6, 2 times 5 is 10, ſet down 0, and carry 1; 2 times 2 is 4, and 1 is 5, which ſet down under the 3 firſt Figures of the *Dividend*, from whence being ſubtracted, ſet the Remainder underneath, which will be 92, then take down 7, making a Point underneath, and ſet it after 92 the Remainder; then ſay how often 2 in 9, Anſwer 3 times (for 4 will prove too many.) Then multiply the *Diviſor* 253, as before, by 3, the Figure laſt placed in the Quotient, and the Product will be 759, which being ſubtracted from the Figures above, the Remainder will be 168, then take down 5, and point it as before, ſetting it after 168, the laſt Remainder: And again, ask the Queſtion, how often 2 is contained in 16? Anſwer 6 times; by which 6, when ſet in the Quotient, multiply the *Diviſor* 253; and the Product is 1518, which place under the laſt *Dividend*, and ſubtract therefrom, there will remain 167. So there being no more Figures to bring down, the Work is finiſh'd, each Man's Share being 236 *l.* and 167 *l.* over, which is to be divided among them; which may eaſily be done by multiplying 167 by 240, and dividing the Product by 253, gives each Man's Share in Pence. The Proof is by multiplying 253 the *Diviſor* by 236 the Quotient; then taking in 167 the Remainder, under the three laſt Figures, the Product will make the ſame with the *Dividend*, as you ſee in the Operation.

The Rule of THREE

IS that, which having three Numbers given, a fourth Number is found in Proportion thereunto; which is done by multiplying the 2d and 3d Numbers together, and dividing that Product by the firſt, and the Quotient of the ſaid Diviſion is the Anſwer to the Queſtion.

Example 1. If in 24 Hours a Ship ſails 130 Miles; How many Miles will ſhe ſail with the ſame Gale in 192 Hours or eight Days?

```
   Hours            Miles           Hours
    24 ------------- 130 ----------- 192
                                     130
                                   -------
24)24960(1040 Miles in 192          5700
   24       Hours                   192
--------                          -------
    96                             24960
    96
--------
    00
```

Here 24 is the firſt Number, 130 the ſecond, 192 the third; wherefore according to the Rule, I multiply 130 and 192 the ſecond and third Numbers together, and divide the Product thereof 24960, by 24 the firſt Number, which gives in the Quotient 1040 Miles, which is the Way the Ship will make in 192 Hours the Time propoſed.

Example 2. If 1lb. of Tobacco coſt 6*d.* what will 112lb. coſt?

```
      112
        6
  -----------
  12)672 Pence (or 56 Shillings.)
```

Here the firſt Number being an Unit, which neither multiplies nor divides, it ſaves the Labour of Diviſion, and the Anſwer is 672*d.* (for the Anſwer will be of the ſame Name with the ſecond Number) which divided by 12 to bring them into Shillihgs, gives the Quotient 56*s.* which is the Price of 112lb. as required.

Example 3. If a Staff of 3 Yards long give a Shadow of 2 Yards: How high is that Caſtle whoſe Shadow is 100 Foot?

Which Queſtion, for the more ready Solution, ſtate thus:

If 6 Foot (which is 2 Yards) give 9 Foot, what ſhall 100 Foot give?

By the Operation it appears, the ſaid Caſtle muſt be 150 Foot high.

```
      9
  ---------
  6)900(150 Foot
    6
  ---   ---
    30
    30
  ---------
    00
```

Example 4. If 564*l.* 12*s.* 6*d.* is to be divided between 165 Men, how much is one Man's Share?

Firſt, reduce it all into Pence, by multiplying 564 by 20 (the Shillings in one Pound) taking in the 12 Shillings, as you are taught in Multiplication, and the Sum 11292 multiply by 12 (the Pence in one Shilling) and add the 6 Pence, the Sum 135510 is the Pence in 564*l.* 12*s.* 6*d.* Then ſay,

If 165 Men have 135510 Pence, how many ſhall one Man have? And here you ſhould multiply 135510 by the laſt Number, but here it is 1, which will neither multiply nor divide, therefore you only divide 135510 the Sum of Pence, by 165 the Number of Men, and the Quotient 821 is the Pence for each Man's Share, which divided by 12 (the Pence in one Shilling, gives 68 Shillings, and the 5 remaining are 5 Pence to each Man's Share.

Note, The 45 remaining of the firſt Diviſion is only $\frac{45}{165}$ of one Penny, which is little more than a Farthing.

The Operation follows.

```
       564l. 12s. 6d.
           20
   ------------
      11292
          12
   ------------
      22590
     11292
  165)135510(821 Pence
      1320
   ------------
       351
       330
   ------------
        210
        165
   ------------
         45
```

```
  12)821(68 Shillings equal
     72       to 3l. 8s. 5d.
  ----------
     101
      96
  ----------
       5 Pence.
```

Note, That in the *Rule of Three*, the firſt and third Number muſt be both of one Denomination, and the ſecond muſt be brought into the loweſt Value expreſſed therein, as in the foregoing Example. I work not the Queſtion as it was firſt ſtated, but tranſpoſing the Numbers, I put the Denomination of Men firſt and laſt, and the Money in the midſt, to anſwer to that part of the Rule, which requires the firſt and third Numbers to be both of one Name. The Anſwer thereof in the preceding Queſtion, as by the Operation appears, is 821 pence; which reduced into Shillings, is 68*s.* and 5*d.* or 3*l.* 8*s.* and 5*d.* which is one Man's Share, which was required.

The next thing I ſhall briefly treat of, is *The Extraction of the Square and Cube Roots*, as alſo ſomewhat of their Uſe.

The Extraction of the Square Root.

Example 1. TO extract the Square Root of 7056 proceed thus: Firſt point the given Numbers (that is, put a prick over every other Figure) beginning at the firſt Figure at the Right-hand, and note by the way, that ſo many Points as the ſaid Number admits over it, of ſo many Figures conſiſts the Root of the ſaid Number, then proceed, ſeeking the greateſt ſquare Number (which is a Number multiplied by it ſelf) in the firſt Point towards the Left-hand (70) which is 64 conſtituted of 8 multiplied into it ſelf; for 8 times 8 is 64. The Root of the Square Number, which is 8, place in the Quotient, and ſubſcribe the ſquare Number (64) under the ſaid firſt Point, ſubtracting it therefrom, and ſetting down the Remainder (6) underneath: To this Remainder bring down the next Point (56) then drawing a crooked Line, on the Left-hand of the Dividend (656) double the Quotient, and place it (*viz.* 16) therein, calling it the Diviſor, ſeek how often the Diviſor is contained in all the Figures of the Dividend, ſave the laſt to the Right-hand: (*viz.*) How many Times 16 in 65? The anſwer is 4 times, which place in the Quotient, and alſo on the Right-hand of the Diviſor (16) then multiply the Diviſor (164) by the 4 laſt placed in the Quotient, and put the Product, which is 656, under the Dividend, ſubtracting it therefrom; which done, nothing remains: So that the Square Root of 7056 is 84.

```
 .  .
7056(84 Root
64
------
164(656 Diviſor
    656
    ---
    000
```

The Square Root is applied to Navigation, as follows:

Any two ſides of a Right-angled Plain Triangle being given, the third is found by the Extraction of the Square Root.

Example 2. Suppoſe a Ship to have made 87 Miles Difference of Latitude, and 71 Miles Departure, and the Diſtance to be required, the ſaid Diſtance is found by the Extraction of the Square Root, as follows.

The Rule. Square the Difference of Latitude and Departure ſeverally (that is, multiply each by it ſelf) and from the Sum of both the Squares added together, extract the Square Root, which will be the Diſtance required.

Example.

Difference of Lat. 87.	The Departure 71.	Square Diff. Lat. —— 7569
Multiplied by it ſelf 87.	Multip. by ſelf 71.	Square Departure —— 5041
609	71	Their Sum 12610
696	497	
The Square —— 7569	The Square 5041	

By this Operation it appears, that the Diſtance, omitting the Fraction, is 112 Miles.

12610(112, the Diſtance req.
1
21)26
21
222) 510
444
66

Examp. 2. Suppoſe a Ship's Diſtance to be 111 Miles, and her Departure 57 Miles, and the Difference of Latitude to be requir'd; the ſaid Difference of Latitude is found by the Extraction of the Square Root, as follows.

The Rule. From the Square of the Diſtance ſubtract the Square of the Departure, and the Square Root of the Remainder will be the Difference of Latitude required.

Example. The Diſtance ——	111	—— The Departure ——	57
Multiplied by it ſelf ——	111	—— Multiplied by it ſelf ——	57
	111		399
	111		285
	111	Sq. of Departure ——	3249
Square of the Diſtance	12321		
Square of Dep. ſubtract	3249		
Remains	9072		

9072(95 Diff. Lat. required.
81
185)972
925
47

The Difference of Latitude, as by the Operation appears, is 95 Miles, omitting Fractions.

If the Departure be required, the Rule is, from the Square of the Diſtance, ſubtract the Square of the Difference of Latitude, and the Square Root of the Remainder is the Departure required. The Operation, for Brevity-ſake, is omitted.

Having proceeded thus far in ſhewing the *Practitioner* how to find the Diſtance, Difference of Latitude and Departure (any two of them being given) without *Trigonometry*, I ſhall ſhew the manner of finding the Courſe exact enough for common Uſe, without the ſaid Operation, which is done as follows:

The Proportion to find the Courſe. As the Sum of the Hypotenuſe (or Diſtance) and half the greater of the other 2 Legs (*viz.*) if the Difference of Latitude be moſt, half that, but if the Departure be moſt, half that: I ſay; As the Sum of theſe two is in Proportion to the leſſer (or remaining) Leg, ſo is 86 to the Angle (in Degrees) oppoſite to the leſs Leg; which is the Courſe, when the Departure is leſs than the Difference of Latitude, otherwiſe 'tis the Complement of the Courſe.

Examp. Admit a Ship's Diſtance to be 110; the Difference of Latitude to be 88, and the Departure 66, and the Courſe required.

Firſt, add the Diſtance, and half the greater Leg into one Sum.

The Diſtance is ———————— 110
Half the greater Leg (88) is ———— 44
The Sum ———————— 154

Having thus done, ſay by the *Rule of Three.*

As the ſaid Sum 154 is to 66 the leſſer Leg, ſo is 86 to the Courſe.

To bring out the odd Minutes, multiply the Remainder of the Diviſion 132 by 60, (the Number of Minutes contained in a Degree) and divide the Product by the *Diviſor* (154) and the Quotient of the ſaid *Diviſion* gives for the Anſwer 51 Minutes; So that the Courſe required is 36 deg. 51 minutes.

```
        66
      ———
       516
       516
      ———
154)5676(36 deg.  51 min.
     462           132
     ———            60
     1056         ———
      924    154)7920(51
     ———           770
      132         ———
                   220
```

Example 3. *Extraction of the Square Root.* Suppoſe a Rope of 5 Inches Compaſs, and another Rope of double the Strength is required. The Dimenſions of the ſaid required Rope are found by the *Extraction of the Square Root*: For ſhould it be ſuppoſed that a Rope of 10 Inches Compaſs, is but double the Strength of a Rope of 5 Inches; upon Proof it is manifeſtly falſe, for the ſaid Rope of 10 Inches is 4 times the Strength of that of 5.

The Rule. Take the Compaſs of the given Rope (*viz.* 5.) and multiply that by itſelf; which Product (becauſe the other Rope is to be twice as ſtrong) multiply it by 2, and the Square Root of the Product is the Compaſs of the Rope required. *Inc.*

```
Example. The given Rope's Compaſs 5 Inches, Extract the Root 50(7
Multiplied by itſelf ——————————— 5                             49
                                ———                           ———
The Square ————————————————————— 25                             1
Multiplied by —————————————————— 2
                                ———
                                 50
```

So that by the Operation it appears a Rope to be twice the Strength of the given Rope of 5 Inches Compaſs, muſt be 7 Inches and a little better.

If it's deſir'd to know the Weight of one Rope by another, 'tis as follows.

The Proportion is, As the Square of the Compaſs of the one Rope is to the Square of the Compaſs of the other; ſo is the Weight of the one to the Weight of the other, Length for Length: *Ex.* Suppoſe a Cable of 10 Inches to weigh 25 Hundred, and the Weight of a Cable of 8 Inches required. Say, as 100 (the Square of 10) is to 64 the Square of 8: ſo is 25 C. the Weight of one Cable to 16 C. the Weight of the other required. *Ex.*

Extraction of the Cube Root.

I Shall firſt, as neceſſary, inſert a Table of the Cubes of the Nine Digits; which ought to be committed to Memory.

Cubes of the Nine Digits

1	001	4	064	7	343
2	008	5	125	8	512
3	027	6	216	9	729

Example 1. Extract the Cube Root of 12167.

12167(23	Root
8	
4167	Reſolvend
1200	Triple Square
60	Triple Quotient
1260	Diviſor
3600	
540	
27	
4167	
000	

Firſt, Point the given Number (*i. e.*) put a Prick over every third Figure (beginning at the Right Hand) then ſeek the greateſt Cube in the firſt Point (*viz.* 12.) which is 8, the Cube Root whereof (which is 2) place in the Quotient; ſubtract the Cube (8) from the firſt Point (12) place the Remainder underneath; to this Remainder bring down the next Point (167) and call this the Reſolvend, then draw a Line underneath it, then ſquare the Quotient 2, which is 4; multiply the ſaid Square (4) by 300, which makes 1200; place this under the Reſolvend, and call it the Triple Square. Again, multiply the Quotient (2) by 30, which makes 60; place this under the Triple Square, and call it the Triple Quotient; add theſe two, (*viz.*) Triple Square and Triple Quotient into one Sum, and call it the *Diviſor*; ſeek how often this *Diviſor* is contained in the Reſolvend, which is three Times; which 3 placed in the Quotient, multiply the Triple Square by the Figure 3 laſt placed in the Quotient, and ſubſcribe the Product underneath the *Diviſor*; ſquare the ſaid Figure (3) laſt placed in the Quotient, and thereby multiply the Triple Quotient, and place it underneath the laſt Product: Cube the Figure (3) laſt placed in the Quotient, and place it under the preceding Products. Laſtly, add theſe three Products into one Sum, ſubtracting the ſaid Sum from the Reſolvend, ſubſcribe the Remainder; to which Remainder had there been any more Figures, the next Point muſt have been brought down, and the preceding Work repeated from the Squaring of the Quotient, until all the Figures are ſo brought down; but in this Example there being no more Figures, the Work is done, and by the Operation the Cube Root of 12167 appears to be 23, nothing remaining.

Example 2. *applied.* Suppoſe a Ship of 300 Tun, 75 Foot by the Keel, 29 Foot and a half at the Beam, and 14 Foot deep in the Hold; another Ship is deſired of the ſame Mould and Shape of 500 Tuns, the ſeveral Dimenſions of the Ship are found by the Extraction of the Cube Root. *Example*. Beginning with the Keel. Firſt, Cube the Length of the given Keel, which is done by multiplying it into itſelf, and then multiplying the Product by it again.

Then ſay by the Rule of Three; As 300 Tun the one Ship's Burthen; to 500 Tun the other Ship's Burthen; ſo is 421875 the Cube of one Ship's Keel's Length, to the Cube of the other Keel's Length. Which being wrought by the Rule of Three, gives 703125: From which extract the Cube Root, and that will be the Length of the Keel required.

In this Extraction 3 Cyphers are added to bring out the Fraction, the Operation therewith being the ſame as if there had been more Figures in the propoſed Number; the Operation gives for the Length of the Keel required 88 Foot $\frac{9}{10}$ Part.

Thus having found one of the Dimenſions, the reſt may be found without the Extraction of the Root, by the Rule of Three.

Thus, ſuppoſe the next thing I would find be her Breadth by the Beam, ſay, as the Length of the one Ship's Keel 75, is to the Length of the other 89 *fere*: So 29 $\frac{1}{2}$ Foot, the Breadth of the one Ship by the Beam, to the Breadth of the other, which by the Rule of Three, gives 35 Foot $\frac{3}{4}$. So you may find the Depth in the Hold, *&c.*

Example 3. Suppoſe an Iron Shot 4 Inches Diameter to weigh 9lb. and the Diameter of a Shot of any other Weight, ſuppoſe of 72lb. required. This is alſo done by the Extraction of the Cube Root as follows:

Firſt, ſay, by the Rule of Three,

As 9lb. the Weight of one Shot, to 72lb. the Weight of the other; ſo is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter; which by the Operation is 512, the Cube Root of which is 8, the Diameter of the Shot required.

75 given Keel
75
375
525
5625
75
28125
39375
421875 Cube given Keel

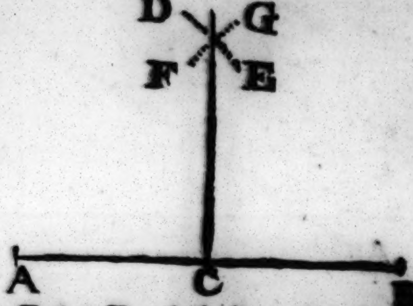
703125 (88 $\frac{9}{10}$ Root
512
191125 Reſolvend
19200 Triple Square
240 Triple Quotient
19440 Diviſor
153600
15360
512
169472
21653000 Reſolvend
2323200 Triple Square
2640 Tr. Quotient
2325840 Diviſor
20908800
213840
729
21123369
529631 Remainder.

But if it were requir'd to find the Weight of a Shot by the Diameter, 'tis done thus, by the Rule of Three.

As the Cube of one Shot's Diameter, to the Cube of the other: So is the Weight of the one Shot, to the Weight of the other required.

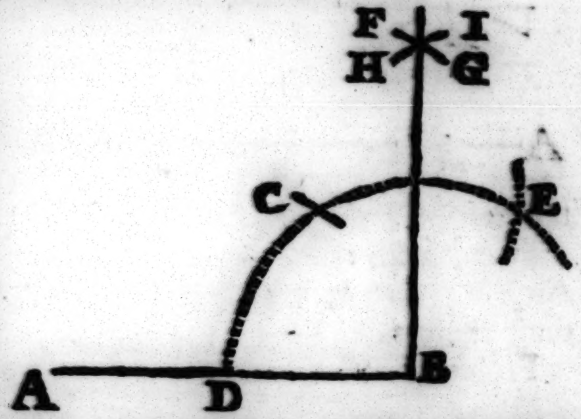
And thus much for the *Arithmetical Part* of this Treatiſe.

Prob. I. *To raiſe a Perpendicular from any Point propoſed, in a given Right Line.*



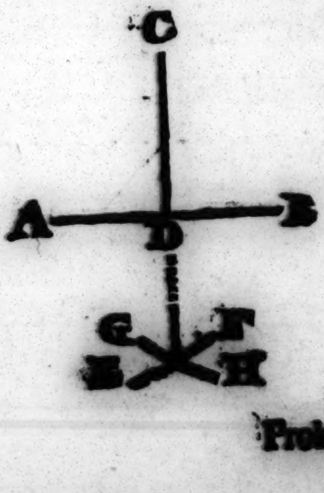
LET the Line given be AB, and the Perpendicular to be raiſed from the Point C; to do which ſet off the two equal diſtances CA and CB. Then the Compaſſes being opened to any convenient diſtance bigger than AC or CB, with one Foot of the Compaſſes in the Point A, deſcribe the Arch DE; then with the ſame Extent, and one Foot in the Point B, deſcribe the Arch FG, then draw the Perpendicular from the Point C, thro' the Interſection, (or cutting) of the two Arches FG and DE, which was required.

Prob. II. *To raiſe a Perpendicular on the End of a Line.*



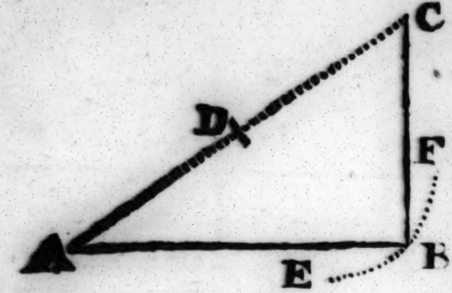
Let the Line given be AB, the Perpendicular to be raiſed from the Point B, to do which, with one Foot of the Compaſſes at B, with any convenient diſtance, as BD, ſweep an Arch; then with the ſame Extent, one Foot of the Compaſſes being in the Point D, mark the ſaid Arch at the Point C, and one Foot being at C, mark it at E; then with the ſame diſtance, one Foot o[illegible] Compaſſes being in the Point C, deſcribe the Arch FG; and placing the Compaſſes in the Point E, deſcribe the Arch HI; then from the Point B, and through the Interſection of the two Arches FG and HI, draw the Perpendicular which was required.

Prob. III. *To let fall a Perpendicular from a Point aſſigned over a given Right Line.*



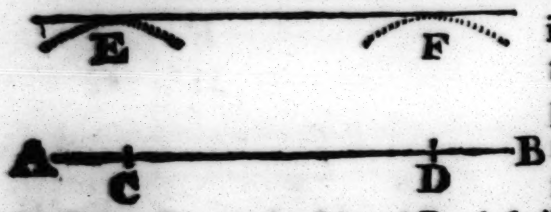
Let AB be the Line given, C the Point over the Line from which the Perpendicular is to fall; to do which, place one Foot of the Compaſſes in the Point C, then opening them to a convenient diſtance, mark the Line AB in two Points with the ſaid diſtance, as in the Points A and B; then with one Foot of the Compaſſes in the Point A, deſcribe the Arch EF, and with one Foot in the Point B, deſcribe the Arch GH; then from the Point C, and thro' the Interſection of the ſaid two Arches, draw the Perpendicular CD, which was required.

Prob. IV. *Another way to let fall a Perpendicular from a given Point on a given Right Line.*



Let the Line given be AB, upon which let it be required to let fall a Perpendicular from the Point C; to do which, from the Point aſſigned C, draw the Line CA; which Line divide into two equal Parts, as in the Point D; then one Point of the Compaſſes reſting in the Point D, with the ſame diſtance, (*viz.* of half the Line A C) deſcribe the Arch EF; then from the Point C, to the Interſection of the Arch EF with the Line AB, draw the Perpendicular CB.

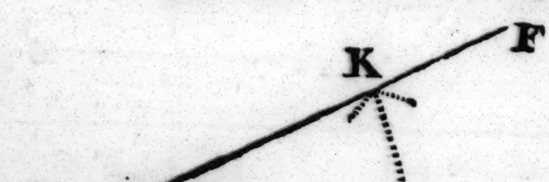
Prob. V. *To draw a Line parallel to a Line given.*



Let AB be a Line given, to which it is required to draw a Line parallel; to do which, firſt take in the Compaſſes the diſtance at which the parallel Line is to be drawn, and then ſetting one Foot of the Compaſſes in the Point C, on the Line AB, deſcribe the Arch E; and with the ſame diſtance, with one Foot of the Compaſſes in the Point D, deſcribe the Arch F; then laying a Ruler to touch the Convexity of the two Arches, draw the parallel Line FE.

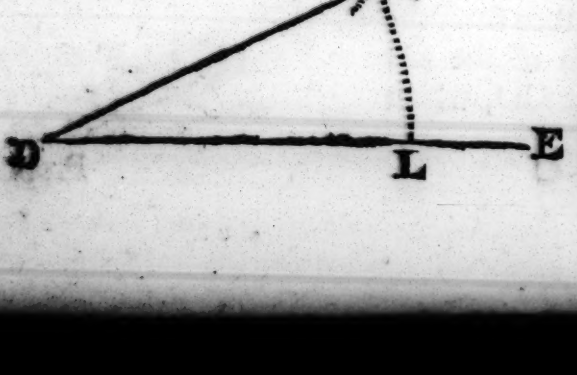
Prob. VI. *To draw a Right Line parallel to a given one, that ſhall paſs through a point given.*

Suppoſe AB the given Line, and it's required to draw a Line parallel thereto, that ſhall paſs through a given Point, as C.

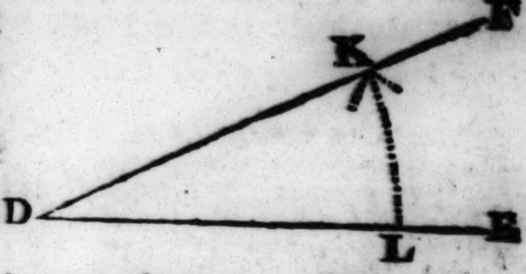


Set one Foot of the Compaſſes in C, with the other at any diſtance, croſs AB in D, and with that diſtance from any Point, as A, of the Line AB deſcribe an Arch EF; then from C with the diſtance AD croſs the Arch in G; draw the Line CG, which ſhall be parallel to the given Line AB, as was required.

Prob. VII. *To make an Angle equal to any Angle given.*

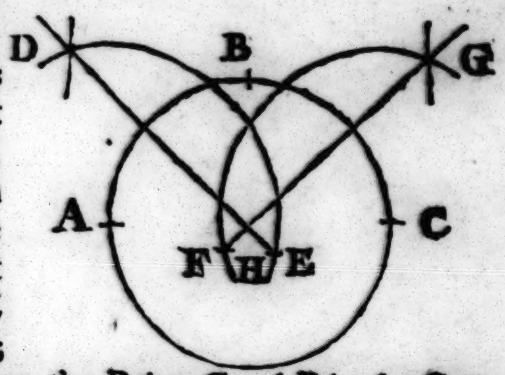


Suppoſe FDE an Angle given, and it is required to make another Angle equal thereto: To do this, firſt draw the Line DE, then with any convenient diſtance leſs than DE, deſcribe the Arch KL, then placing the Compaſſes at D, with the ſame diſtance which ſwept the



Arch KL ſweep the Arch KL; take the Arch KL in the Compaſſes, and ſetting one Foot in the Point L, croſs the Arch LK in the Point K, then through the Point K draw the Line DKF, then is the Angle EDF equal to the Angle EDF, as was required.

Prob. VIII. *To bring any three Points not ſituate in a Right Line, into the Circumference of a Circle.*



Let the three Points thro' which the Circle is to paſs be ABC: Take above half the diſtance between the two Points A and B in the Compaſſes; and one Foot of the Compaſſes being in the Point A, with the ſaid diſtance deſcribe the Arch ED; and with the ſame diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch ED in the Points E and D, and draw the right Line ED; then take above half the diſtance between the Points C and B in the Compaſſes, and one Foot of the Compaſſes being in the Point C, with the ſaid diſtance deſcribe the Arch FG; and with the ſame diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch FG, in the Points F and G, and draw the Right Line FG. Now where the two Right Lines DE and FG, being continued, interſect each other (*viz.* in the Point H) is the Center of the Circle, which was required.

The Deſcription of the Mariner's Compaſs.

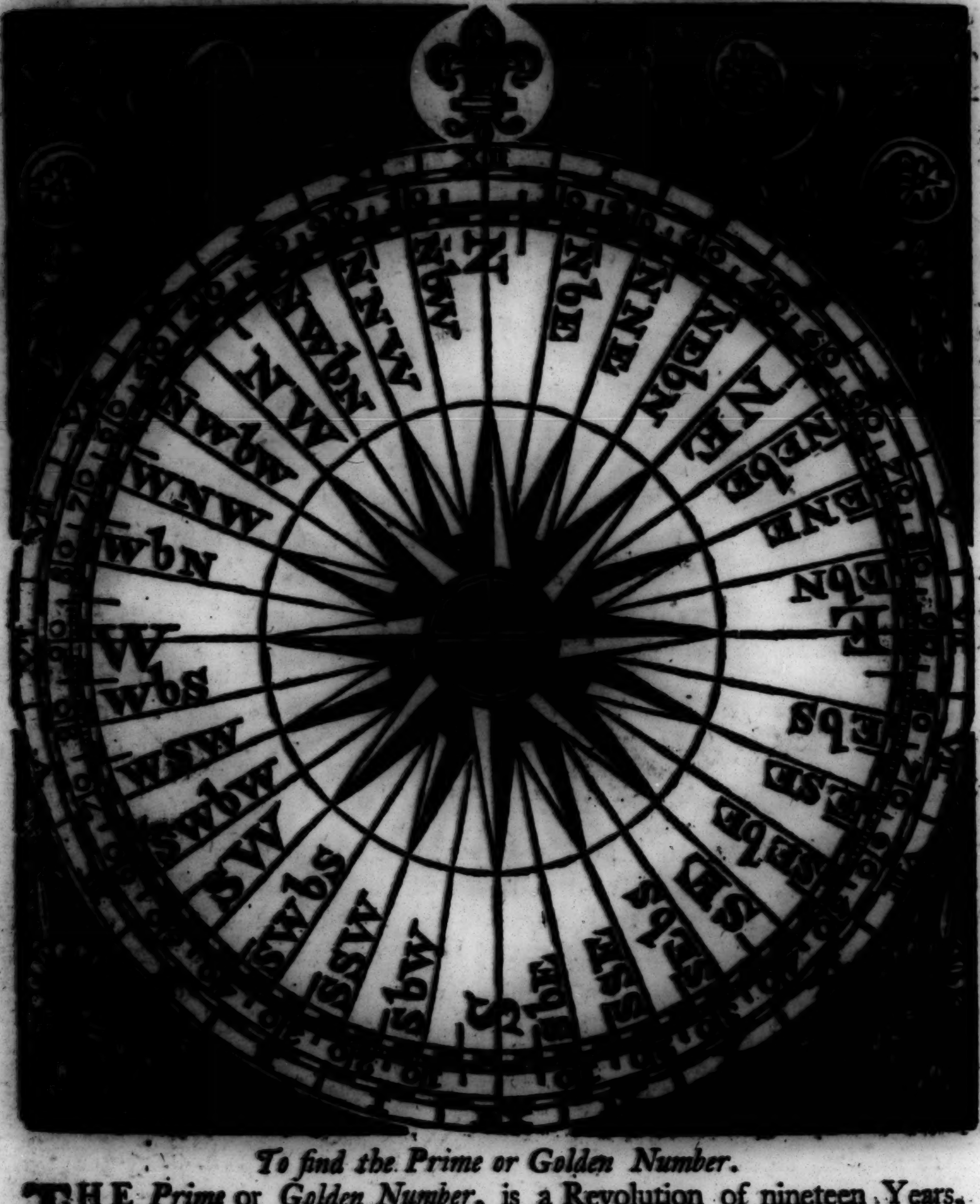
THIS Inſtrument, ſo beneficial an Aſſiſtant to the *Practical Part* in Navigation, as to its Inventor, is uncertainly diſcourſed of; its Age, by ſome ſuppoſed to be in theſe Parts of the World about 300 Years; the Utility whereof to us evidently appears, conſidering the many Inconveniencies that attended our Anceſtors, in tracing the vaſt Ocean, for want of ſuch a Guide, under whoſe ſubordinate Conduct of later Years, our Maritime Affairs have ſucceeded ſo well.

It is a Circle of greater or leſſer Diameter at pleaſure, deſcribed upon a Paſte-board, and divided into 360 Degrees, and 32 Points, (and ſometimes into 24 Hours) each Point containing 11 deg. 15 min. or 3 quarters of an Hour; as in the following Figure.

The Circle being thus divided upon the Chard or Paſte-board, there are paſted on the other Side of the ſaid Chard or Paſte-board, two Wires, which Wires being touched with the Loadſtone, and the Chard hung at the Center upon a Pin, fix'd in a Box, its Poſition becomes North or South;

and the ſaid Box being cover'd with a Glaſs, and hung in another ſquare Box, to the End the Chard may traverſe notwithſtanding the Ship's Motion; being thus fixed, is ready for Uſe.

The Figure of the Mariner's Compaſs.



To find the Prime or Golden Number.

THE *Prime* or *Golden Number*, is a Revolution of nineteen Years, in which Term the Moon returns to make the ſame Aſpects with the Sun on the ſame Day of the Month (moſt commonly) that they were on *Nineteen Years* before.

To find which, add 1 to the Year of our Lord, and divide by 19, the Remainder is the *Prime* or *Golden Number*, but if nothing remains, the *Prime* is 19. *Example*.

Example. To find the *Golden Number for the Year* 1746, add 1 which makes 1747; which divide by 19.

19)1747(91
171
37
19
18

The Remainder 18 is the *Golden Number* for the Year 1746.

To find the Epact.

THE *Epact* is the Number of Days that the *Solar Year* of 365 Days exceeds the *Lunar Year* (or 12 Revolutions of the Moon to the Sun) of 354 Days, the Difference being 11 Days: When the *Golden Number* is 1, the *Epact* is 11; when 2, the *Epact* is twice 11 or 22; when 3, thrice 11 or 33 (rejecting 30) that is 3, *&c.* and it is thus found: Divide the Prime by 3, if 0 remain, the *Epact* is the ſame with the Prime; if 1 remain add 10, if 2 add 20 to the Prime, the Sum (rejecting 30, if need be) is the *Epact.*

Examp. In the Year 1759, the *Golden Number* is 12; which divide by 3 there remains 0; which ſhews the *Epact* is 12, the ſame with the *Prime.*

In the Year 1748, the *Golden Number* is 1, which added to 10 (becauſe 1 cannot be divided by 3) makes 11 for the *Epact.*

In the Year 1743, the *Golden Number* is 15, which divided by 3, there remains 0, therefore the *Epact* is 15, the ſame with the *Golden Number.*

Or, Multiply the *Golden Number* by 11, and divide the Product by 30, the Remainder is the *Epact.*

To find the Moon's Age.

ADD to the *Epact* for *March* 1, for *April* 2, for *May* 3, for *June* 4, for *July* 5, for *Auguſt* 6, for *September* 8, for *October* 8, for *November* 10, for *December* 10, for *January* 0, for *February* 2.

Having added to the *Epact* the Number for the Month, according to the Rule foregoing, add thereto the Day of the Month, for which the Moon's Age is required: Theſe three Sums added together, if leſs than 30, is the Moon's Age; if more than 30, then divide it by 30, the Remainder is the Age of the Moon. The Moon's Age ſubtracted from 30, leaves the Day of the Change. Again, 15 added to, or ſubtracted from the Day of the Change, leaves the Day of Full Moon.

Example. Suppoſe it were requir'd to find the Moon's Age for the firſt Day of *April*, 1746.

Firſt, Set down the *Epact* for that Year——18
To which add the Number for the Month, which is ——2
To that add the Day of the Month, which is——1
Sum, gives the Moon's Age——21

Then out of 30
Take——21 The Moon's Age
Remains——09 Days to Change
Add——15
Makes——24 Days to the Full Moon.

To find the Moon's Southing by her Age, ſee in the Uſe of the Tide-Table, which follows immediately after it.

To find the Dominical Letter.

TAKE the Year and its fourth Part, and add 4 to it; then divide that Sum by 7, and ſubtract what remains from 7, the Remainder ſhews the thing required; accounting the Letter A for 1, B for 2, C for 3, D for 4, E for 5, F for 6, G for 7.

Suppoſe the Dominical Letter was required for the Year —— 1747
Firſt, Set down the Year —— 1747
Then the 4th Part, which omitting Fractions is —— 436
To which add —— 4
The Sum divided by —— 7)2187(312
21
8
7
17
14
3
7
4

The Remainder after Diviſion is 3, which being ſubtracted from 7, leaves 4; which ſhews it muſt be the fourth Letter, which is D, the Dominical Letter for the Year 1747. But when it is Leap-year, there are two Dominical Letters, and then the Letter thus found ſerves from the laſt of *February* to the End of the *Year*.

To find the Cycle *of the Sun.*

ADD to the Year 9, divide the Sum by 28, the Remainder is the Cycle of the Sun.

Suppoſe it be required for the *Year* 1751
Then add —— 9
Divide by —— 28)1760(62
168
80
56
24

By the Operation it appears, that 24 is the Cycle of the Sun for the *Year* 1751, being the Remainder after the Diviſion.

Note, *Hillary* Term begins *Jan.* 23, and ends *Feb.* 12.

Eaſter Term begins 17 Days after *Eaſter-day*, and ends *Monday* before *Whitſunday*.

Trinity Term begins on *Friday* after *Trinity-Sunday*, and ends nineteen Days after.

Michaelmas Term begins *October* 23, and ends *November* 28.

A Table

A Table of the Moon's Age for the Year 1742.

Months		D	H.
January	Firſt quart.	02	11 A
	Full moon	09	10 A
	Laſt quart.	17	08 A
	New moon	25	noon
February	Firſt quart.	01	08M
	Full moon	08	02M
	Laſt quart.	16	04M
	New moon	23	12 A
March	Firſt quart.	02	04 A
	Full moon	10	05M
	Laſt quart.	18	05M
	New moon	25	09M
April	Firſt quart.	01	01M
	Full moon	08	11 A
	Laſt quart.	16	11 A
	New moon	23	05 A
	Firſt quart.	30	11M
May	Full moon	08	03 A
	Laſt quart.	16	10M
	New moon	23	01M
	Firſt quart.	30	01M
June	Full moon	07	06M
	Laſt quart.	14	06 A
	New moon	21	08M
	Firſt quart.	28	04 A

Months		D.	H.
July	Full moon	06	07 A
	Laſt quart.	13	11 A
	New moon	20	06 A
	Firſt quart.	28	10M
Auguſt	Full moon	05	06M
	Laſt quart.	12	05M
	New moon	19	04M
	Firſt quart.	27	04M
September	Full moon	03	05 A
	Laſt quart.	10	10M
	New moon	17	06 A
	Firſt quart.	25	09 A
October	Full moon	03	02M
	Laſt quart.	09	06 A
	New moon	17	11M
	Firſt quart.	25	02 A
November	Full moon	01	noon
	Laſt quart.	08	05M
	New moon	16	06M
	Firſt quart.	24	06M
	Full moon	30	11 A
December	Laſt quart.	07	07 A
	New moon	16	02M
	Firſt quart.	23	06A
	Full moon	30	10M

Four Eclipſes this Year, two of each Luminary.

The Firſt is of the Moon, *May* the 8th, inviſible.
The Second is of the Sun, *May* the 22d, inviſible.
The third is of the Moon, *November* the 1ſt, inviſible.
The Fourth is of the Sun, *November* the 16th, inviſible.

A Table of the Moon's Age for the Year 1743.

Months		D.	H.
January	Laſt quart.	6	3 A
	New moon	14	5 A
	Firſt quart.	22	4 M
	Full moou	28	10 A
February	Laſt quart.	5	1 A
	New moon	13	11 M
	Firſt quart.	20	11 M
	Full moon	27	10 M
March	Laſt quart.	7	9 M
	New moon	14	12 A
	Firſt quart.	21	6 A
	Full moon	28	12 A
April	Laſt quart.	6	4 M
	New moon	13	10 M
	Firſt quart.	20	1 M
	Full moon	27	3 A
May	Laſt quart.	5	7 A
	New moou	12	6 A
	Firſt quart.	19	10 M
	Full moon	27	8 M
June	Laſt quart.	4	8 M
	New moon	11	1 M
	Firſt quart.	17	8 A
	Full moon	25	10 A
July	Laſt quart.	3	6 A
	New moon	10	8 M
	Firſt quart.	17	9 M
	Full moon	25	1 A
Auguſt	Laſt quart.	2	1 M
	New moon	8	4 A
	Firſt quart.	16	1 M
	Full moon	24	2 M
	Laſt quart.	31	6 M
September	New moon	7	2 M
	Firſt quart.	14	6 A
	Full moon	22	3 A
	Laſt quart.	29	noon
October	New moon	6	2 A
	Firſt quart.	14	3 A
	Full moon	22	3 M
	Laſt quart.	28	8 A
November	New moon	5	6 M
	Firſt quart.	13	11 M
	Full moon	20	3 A
	Laſt quart.	27	6 M
December	New moon	5	1 M
	Firſt quart.	13	5 M
	Full moon	20	1 M
	Laſt quart.	26	7 A

Five Eclipſes this Year, three of the Sun, and two of the Moon.

The Firſt of the Sun, *April* the 13th, inviſible.
The Second of the Moon, *April* the 27th, inviſible.
The third of the Sun, *May* the 12th, viſible.
The Fourth of the Moon, *October* the 21ſt, viſible and total.
The Fifth of the Sun, *November* the 5th, inviſible.

A Table of the Moon's Age for the Year 1744.

Months.		D.	H.
January	New moon	3	8 A
	Firſt quart.	11	8 A
	Full moon	18	11 M
	Laſt quart.	25	11 M
February	New moon	2	3 A
	Firſt quart.	10	6 M
	Full moon	16	0 A
	Laſt quart.	24	4 M
March	New moon	3	8 M
	Firſt quart.	10	2 A
	Full moon	17	9 M
	Laſt quart.	24	mid.
April	New moon	1	10 A
	Firſt quart.	8	9 A
	Full moon	15	8 A
	Laſt quart.	23	6 A
May	New moon	1	9 M
	Firſt quart.	8	3 M
	Full moon	15	9 M
	Laſt quart.	23	1 A
	New moon	30	6 A
June	Firſt quart.	6	9 M
	Full moon	13	11 A
	Laſt quart.	22	3 M
	New moon	29	1 M
July	Firſt quart.	5	5 A
	Full moon	13	2 A
	Laſt quart.	21	3 A
	New moon	28	8 M
Auguſt	Firſt quart.	4	4 M
	Full moon	12	5 M
	Laſt quart.	19	mid.
	New moon	26	4 A
September	Firſt quart	2	4 A
	Full moon	10	9 A
	Laſt quart.	18	8 M
	New moon	25	1 M
October	Firſt quart.	2	10 M
	Full moon	10	1 A
	Laſt quart.	17	4 A
	New moon	24	1 A
November	Firſt quart.	1	8 M
	Full moon	9	3 M
	Laſt quart.	15	mid.
	New moon	23	3 M
December	Firſt quart.	1	6 M
	Full moon	8	4 A
	Laſt quart.	15	9 M
	New moon	22	8 A
	Firſt quart.	31	1 M

Four Eclipſes this Year, two of each Luminary.

The Firſt will be of the Sun, *Apil* the 1ſt, inviſible.
The Second will be of the Moon, *April* the 15th, viſible 9 Digits.
The Third will be of the Sun, *September* the 24th, inviſible.
The Fourth will be of the Moon, *October* the 10th, inviſible.

A Table of the Moon's Age for the Year 1745.

Months		D.	H.
January	Full moon	7	4M
	Laſt quart.	13	7 A
	New moon	21	3 A
	Firſt quart.	29	6 A
February	Full moon	5	2 A
	Laſt quart.	12	7M
	New moon	20	9M
	Firſt quart.	28	7M
March	Full moon	6	11 A
	Laſt quart.	13	10 A
	New moon	22	3M
	Firſt quart.	29	6 A
April	Full moon	5	8M
	Laſt quart.	12	4 A
	New moon	20	6 A
	Firſt quart.	28	1M
May	Full moon	4	6 A
	Laſt quart.	12	8M
	New moon	20	7M
	Firſt quart.	27	6M
June	Full moon	3	5M
	Laſt quart.	11	4M
	New moon	18	4 A
	Firſt quart.	25	10M
July	Full moon	2	4 A
	Laſt quart.	10	7 A
	New moon	18	1M
	Firſt quart.	24	4 A
Auguſt	Full moon	1	6M
	Laſt quart.	9	10M
	New moon	16	9M
	Firſt quart.	22	mid.
	Full moon	30	10 A
September	Laſt quart.	7	11 A
	New moon	14	5 A
	Firſt quart.	21	noon
	Full moon	29	3 A
October	Laſt quart.	7	10M
	New moon	14	3M
	Firſt quart.	21	4M
	Full moon	29	9M
November	Laſt quart.	5	8 A
	New moon	12	1 A
	Firſt quart.	19	mid
	Full moon	28	1M
December	Laſt quart.	5	4M
	New moon	12	2M
	Firſt quart.	19	9 A
	Full moon	27	4 A

There will be two Eclipſes this Year, both of the Sun.

The firſt will be on *March* the 21ſt, viſible.

The ſecond will be on *September* the 14th, inviſible.

A Table of the Moon's Age for the Year 1746.

Months.		D.	H.
January	Laſt quart.	3	1 A
	New moon	10	5 A
	Firſt quart.	18	7 A
	Full moon	25	5 M
February	Laſt quart.	1	10 A
	New moon	8	10 M
	Firſt quart.	17	3 A
	Full moon	24	4 A
March	Laſt quart.	3	7 M
	New moon	11	3 M
	Firſt quart.	19	6 M
	Full moon	26	1 M
April	Laſt quart.	1	7 A
	New moon	9	9 A
	Firſt quart.	17	6 A
	Full moon	24	9 M
May	Laſt quart.	1	8 M
	New moon	9	noon
	Firſt quart.	17	2 M
	Full moon	23	5 A
	Laſt quart.	30	mid.
June	New moon	8	2 M
	Firſt quart.	15	8 M
	Full moon	22	1 M
	Laſt quart.	29	5 A
July	New moon	7	2 M
	Firſt quart.	14	1 M
	Full moon	21	11 A
	Laſt quart.	29	10 A
Auguſt	New moon	5	mid.
	Firſt quart.	12	6 A
	Full moon	19	mid.
	Laſt quart.	28	3 M
September	New moon	4	9 M
	Firſt quart	10	min.
	Full moon	18	4 A
	Laſt quart.	26	8 A
October	New moon	3	1 A
	Firſt quart.	10	10 M
	Full moon	18	9 M
	Laſt quart.	26	10 M
November	New moon	2	4 M
	Firſt quart.	8	mid.
	Full moon	17	4 M
	Laſt quart.	24	11 A
December	New moon	1	2 A
	Firſt quart.	8	6 A
	Full moon	16	10 A
	Laſt quart.	24	9 M
	New moon	31	2 M

There will be four Eclipſes this Year.

The Firſt is *Feb.* 24, at 4 aftern. inviſible, for the Eclipſe ends 23′ e're the Moon riſes, two Thirds of the ☽ Diam. on the lower Side will be darkned.

The Second is of the Sun inviſible, on *March* the 11 at 2 in the Morning.

The Third is of the Moon, viſible at *London* the 19th of *Auguſt* at Midnight, ſix Digits on the upper Side.

The Fourth Eclipſe is of the Sun, on *September* the 4th, at 9 in the Morning inviſible, by reaſon of the Moon's great South Latitude.

A Table of the Moon's Age for the Year 1747.

Months		D.	H.
January	Firſt quart.	7	1 A
	Full moon	15	4 A
	Laſt quart.	22	5 A
	New moon	29	3 A
February	Firſt quart.	6	11 M
	Full moon	14	5 M
	Laſt quart.	21	1 M
	New moon	28	4 M
March	Firſt quart.	8	8 M
	Full moon	15	5 A
	Laſt quart.	22	9 M
	New moon	29	9 A
April	Firſt quart.	7	2 M
	Full moon	14	2 M
	Laſt quart.	20	6 A
	New moon	28	1 A
May	Firſt quart.	6	4 A
	Full moon	13	9 M
	Laſt quart.	20	4 M
	New moon	28	4 M
June	Firſt quart.	5	1 M
	Full moon	11	4 A
	Laſt quart.	18	3 A
	New moon	26	7 A

Months		D.	H.
July	Firſt quart.	4	8 M
	Full moon	10	11 A
	Laſt quart.	18	6 M
	New moon	26	9 M
Auguſt	Firſt quart.	2	2 A
	Full moon	9	5 M
	Laſt quart.	16	11 A
	New moon	24	9 A
	Firſt quart.	31	9 A
September	Full moon	7	8 A
	Laſt quart.	15	6 A
	New moon	23	9 M
	Firſt quart.	30	2 M
October	Full moon	7	10 M
	Laſt quart.	15	2 A
	New moon	22	8 A
	Firſt quart.	29	11 M
November	Full moon	6	3 M
	Laſt quart.	14	6 M
	New moon	21	8 M
	Firſt quart.	27	10 M
December	Full moon	5	10 A
	Laſt quart.	13	10 A
	New moun	20	5 A
	Firſt quart.	27	1 A

Six Eclipſes this Year, Four of the Sun and two of the Moon.

The Firſt will be of the Sun, *Jan.* the 29th, inviſible.
The Second will be of the Moon, *Feb.* the 13th, viſible and total.
The Third will be of the Sun, *July* the 26th, inviſible.
The Fourth will be of the Moon, *Auguſt* the 9th, inviſible.
The Fifth will be of the Sun, *Auguſt* the 24th, inviſible.
The Sixth will be of the Sun, *September* the 23d, inviſible.

A Table of the Moon's Age for the Year 1748.

Months		D.	H.
January	Full moon	4	6 A
	Laſt quart.	12	11 M
	New moon	19	3 M
	Firſt quart.	26	8 M
February	Full moon	3	noon
	Laſt quart.	10	10 A
	New moon	17	3 A
	Firſt quart.	25	3 M
March	Full moon	4	4 M
	Laſt quart.	11	6 M
	New moon	18	3 M
	Firſt quart.	25	12 A
April	Full moon	2	4 A
	Laſt quart.	9	noon
	New moon	16	4 A
	Firſt quart.	24	6 A
May	Full moon	2	2 M
	Laſt quart.	8	6 A
	New moon	16	5 M
	Firſt quart.	24	9 M
	Full moon	31	9 M
June	Laſt quart.	6	mid.
	New moon	14	8 A
	Firſt quart.	22	9 A
	Full moon	29	5 A
July	Laſt quart.	6	10 M
	New moon	14	11 M
	Firſt quart.	22	5 M
	Full moon	28	mid.
August	Laſt quart.	4	11 A
	New moon	13	5 M
	Firſt quart.	20	5 A
	Full moon	27	8 M
September	Laſt quart.	3	3 A
	New moon	11	6 A
	Firſt quart.	18	mid.
	Full moon	25	6 A
October	Laſt quart.	3	10 M
	New moon	11	8 M
	Firſt quart.	18	6 M
	Full moon	25	7 M
November	Laſt quart.	2	7 M
	New moon	9	8 A
	Firſt quart.	16	2 A
	Full moon	23	11 A
December	Laſt quart.	2	3 M
	New moon	9	8 M
	Firſt quart.	15	11 A
	Full moon	23	5 A
	Laſt quart.	31	9 A

Four Eclipſes this Year, two of the Sun and two of the Moon.

The Firſt is of the Sun, *January* the 18th, inviſible.
The Second is of the Moon, *February* the 3d, inviſible.
The third is of the Sun, *July* the 14th, viſible 10 Digits.
The Fourth is of the Moon, *July* the 28th, viſible 6 Digits.

A Table of the Moon's Age for the Year 1749.

Months		D.	H.
January	New moon	7	7 A
	Firſt quart.	14	noon
	Full moon	22	1 A
	Laſt quart.	30	1 A
February	New moon	6	5 M
	Firſt quart.	13	4 M
	Full moon	21	7 M
	Laſt quart.	28	12 A
March	New moon	7	3 A
	Firſt quart.	14	5 A
	Full moon	22	11 A
	Laſt quart.	30	8 M
April	New moon	6	1 M
	Firſt quart.	13	2 A
	Full moon	21	1 A
	Laſt quart.	28	2 A
May	New moon	5	11 M
	Firſt quart.	13	8 M
	Full moon	20	12 A
	Laſt quart.	27	7 A
June	New moon	3	11 A
	Firſt quart.	12	1 M
	Full moon	19	9 M
	Laſt quart.	26	1 M
July	New moon	3	1 A
	Firſt quart.	11	4 A
	Full moon	18	9 A
	Laſt quart.	25	8 M
Auguſt	New moon	2	3 M
	Firſt quart.	10	6 M
	Full moon	16	12 A
	Laſt quart.	23	7 A
	New moon	31	7 A
September	Firſt quart.	8	5 A
	Full moon	15	8 M
	Laſt quart.	22	9 M
	New moon	30	noon
October	Firſt quart.	8	2 M
	Full moon	14	6 A
	Laſt quart.	22	1 M
	New moon	30	5 M
November	Firſt quart.	6	10 M
	Full moon	13	6 M
	Laſt quart.	20	9 A
	New moon	28	8 A
December	Firſt quart.	5	6 A
	Full moon	12	8 A
	Laſt quart.	20	8 A
	New moon	28	10 M

Five Eclipſes this Year, Three of the Sun and two of the Moon.

The Firſt will be of the Sun, *Jan.* the 7th, inviſible.
The Second will be of the Moon, *June* the 19th, inviſible.
The Third will be of the Sun, *July* the 3d, inviſible.
The Fourth will be of the Moon, *Decemb.* the 12th, viſible 6 Digits.
The Fifth will be of the Sun, *Decemb.* the 28th, viſible 8 Digits.

A Table of the Moon's Age for the Year 1750.

Months		D.	H.
January	Firſt quart.	4	4M
	Full moon	11	1 A
	Laſt quart.	19	5 A
	New moon	26	10 A
February	Firſt quart.	2	2 A
	Full moon	10	7M
	Laſt quart.	18	11M
	New moon	25	8M
March	Firſt quart.	3	12 A
	Full moon	11	12 A
	Laſt quart.	20	1M
	New moon	26	4 A
April	Firſt quart.	2	2 A
	Full moon	10	5 A
	Laſt quart.	18	10M
	New moon	24	12 A
May	Firſt quart.	2	5M
	Full moon	10	8M
	Laſt quart.	17	4 A
	New moon	24	10M
	Firſt quart.	31	9 A
June	Full moon	8	9 A
	Laſt quart.	15	10 A
	New moon	22	7 A
	Firſt quart.	30	3 A

Months		D.	H.
July	Full moon	8	8M
	Laſt quart.	15	3M
	New moon	22	7M
	Firſt quart.	30	9M
Auguſt	Full moon	6	5 A
	Laſt quart.	13	8M
	New moon	20	9 A
	Firſt quart.	28	12 A
September	Full moon	5	1 M
	Laſt quart.	11	4 A
	New moon	19	noon
	Firſt quart.	27	2 A
October	Full moon	4	10M
	Laſt quart.	11	4M
	New moon	19	8M
	Firſt quart.	27	3M
November	Full moon	2	7A
	Laſt quart.	9	7A
	New moon	18	1M
	Firſt quart.	25	2A
December	Full moon	2	6M
	Laſt quart.	9	3 A
	New moon	17	6 A
	Firſt quart.	24	11 A
	Full moon	31	8 A

Five Eclipſes this Year, three of the Sun, and two of the Moon.

The Firſt is of the Moon, *June* the 8th, viſible and total.
The Second of the Sun, *June* the 22d, inviſible.
The third of the Sun, *Nov.* the 18th, inviſible.
The Fourth of the Moon, *Decemb.* the 2d, viſible and total.
The Fifth of the Sun, *Decemb.* the 17th, inviſible.

The Uſe of the foregoing Table of the Moon's Age.

IN the ſaid Table the one half Page contains the firſt ſix Months of the Year, the other half the following ſix Months; in the firſt Column of each half, towards the Left-hand, are the Months, in the ſecond the New, Full, and Quarters of the Moon; in the two following Columns are the Days and Hours of the ſaid New, Full, and Quarters, either Morning or Afternoon, as the Letters A and M denote, A ſignifying Afternoon, M Morning. At the Bottom of the Tables are the Eclipſes for the reſpective Year.

The Uſe of the Table is, readily by Inſpection, to find the Day, Hour, and Minute of the New, Full, or Quarters of the Moon.

Example 1. Suppoſe it were deſired to find the time of New-moon, *Jan.* 1746. Firſt look for the Year 1746 on the Top of the Leaf, which having found, look for *January* in the firſt Column towards the Left-hand; then in the next Column in the ſame Month is found New-moon; and in the two following Columns againſt New-moon ſtands 10.5 A, which ſhews that the New-moon in *January* 1746 is the 10th Day at 5 Afternoon. The ſame Directions ſerve for the Full Moon, or Firſt and Laſt Quarters.

To find the Moon's Age, ſubtract the Day of the Change or New-moon from the Day propoſed, the Remainder is the Moon's Age. Suppoſe therefore it was required to find the Moon's Age for *March* 30, 1748.

Looking in the Year 1748, the Table gives the New-moon for *March* to be on the 18th Day, therefore 18 being ſubtracted from 30, there remains 12, whereby it appears the Moon is 12 Days old on the 30th of *March* in the Year 1748.

Example. Suppoſe it were required to find the Moon's Age on the 1ſt of *November*, 1746.

The laſt New-moon before *Nov.* 1ſt was *Octob.* 3d, but becauſe you cannot take 3 from 1, you muſt add 31 (the Number of Days in *Octob.*) and from the Sum 32 ſubtract 3: the Remainder 29 is the Moon's Age required.

A Tide Table for the Sea-Coaſts of Great-Britain, Ireland, Norway, Holland, Flanders, France, Biſcay, *&c. Shewing what Moon makes Full Sea, upon the Full and Change Days, at the Places following, in Alphabetical Order.*

A	H.	M.		H.	M.
AT *Army*, NNE. and SSW	01	30	At *Abermorich*, and *Antwerp*, Eaſt and Weſt ————	06	00
At *Amſterdam* and *Armentiers*, NE. and SW. ——	03	00	At *Alborough* SE. by S. and NW by N. ————	09	45
At *Abarwark*, ENE. and WSW. ————	04	30			

B

	H	M
* At *Beachy* and *Blacktail*, and before the *Race of Blanquet*, N and S.	12	00
Thwart of *Beachy* in the *Offing* N by E. and S by W.	00	45
At *Blackneſs* in *Bluet* at *Bell Iſle*, NNE. and SSW.	01	30
Without *Bluet*, and at *Berwick*, NE. by N. and SW by S.	02	15
The River of *Bourdeaux*, the South Coaſt of *Bretagne*, the Coaſt of *Biſcay*, and at *Bockneſs* NE. and S W.	03	00
At *Breſt* before the *Baſe*, the River of *Bourdeaux* within the Haven, NE by E. and SW by W.	03	45
In the *Breeſound*, *Bloy*, *Baltimore*, ENE. and WSW.	04	30
Before *Bremen*, and at *Blackney*, and in the Channel before *Bourdeaux*, Eaſt and Weſt	06	00
At *Briſtol* Key, E by S. and W by N.	06	45
At *Bridgwater* ESE and WNW.	07	30
Bullen deep, SSE and NNW.	10	30

C

	H	M
In *Condado*, N. and S.	12	00
In the *Chamber of Rye*, N by E. and S. by W.	00	45
Without *Calice*, at *Corpus Chriſti* Point, before and at *Camfer*, NNE. and SSW.	01	30
Between *Calice* and *Dover*, before *Conquet*, and at the N. Cape, NE. and S.W.	03	00
At *Cork*, *Calice*, *C. Clear*, and in the *Creek*, ENE. and WSW	04	30
At *Caldy*, and in the Bay of *Camarthan*, E by N. & W by N	05	15
At *Concalo*, E and W.	06	00
Without the *Caskets*, in the Channel SE by E and NW by W.	08	15
* Between *Guernſey* and the *Caskets*, before *Cromer*, before the *Caskets* and *Guernſey*, at *Seven Cliſts*, and at *Catneſs*, SE. and NW.	09	00
At the *Caskets*, and at *Chamberneſs*, SE by S and NW by N	09	45
At *Cows*, in the *Foſs of Caen*, in *Calice Road*, and in *Chamberneſs Road*, SSE and NNW.	10	30
Before the Haven of *Caen*, in the *Chamber*, between *Cripple-ſand* and the *Creyl*, and at *Calſhot*, S by E and N by W.	11	15

D

	H	M
At *Dover Pier*, and before *Dunkirk*, N. and S.	12	00
At *Denbeigh* and *Downs* in the Rcai, NE by N. and SW by S.	02	15
At *Dort* NE and SW	03	00
At *Dungervan*, E.N.E. and WSW	04	30
At *Dartmouth* Eaſt and Weſt	06	00
At *Dublin*, S. E. by E. and N.W. by W.	08	15
At *Dunbar*, SE. and NW.	09	00
At *Dungeneſs* and *Dunnoſe*, SE by S and NW by N.	09	45
At *Dover*, *Diep*, and in the *Downs* a ſhoar, S.S.E. and N.NW.	10	30

E

	H	M
At *Emden*, before the *Elve*, before the *Eyder*, and before *Enchuſen*, N and S	12	00
At *Edam*, NNE. and SSW.	01	30
Before the Eaſtern and Weſtern *Emes*, and at *Engomonts*, SE. and NW.	09	00

F

	H	M
On the Coaſt of *Flanders*, North and South	12	00
At *Fluſhing*, N by E. and S. by W	00	45

	H	M
Before the *Fen*, in the Channel NNE and SSW	01	30
Without *Pountney*, N E by N and SW by S.	02	15
Without the Banks of *Flanders*, NE and SW.	03	00
At *Flamborough* and *Bridlington*, ENE. and WSW.	04	30
At the *Forn*, in *Foy*, at *Falmouth*, E by N and W by S	05	15
Between *Foy* and *Falmouth*, in the Channel, and at *Foulneſs*, E by S and W by N	06	45
Before the Coaſt of *Frizeland*, and the *Fly*, E S E and W N W	07	30
Without the *Fly*, S E by E. and NW by W.	08	15
At *Frize* and *Fair Iſle*, NW and SE.	09	00
At the *Frith*, and at the *South Foreland*, SSE. and NNW	10	30
In *Fair Iſle Roads*, and at the *North Foreland*, S by E and N by W	11	15
G		
In the Road of *Gibraltar*, at *Graveling*, and before *Cherburg*, N and S	12	00
Before *Goeree*, at *Guernſey*, & at *Graveſend*, NNE. and SSW.	01	30
At *Groin*, at *Caſcoign*, and the Coaſt of *Galicia*, NE. and SW.	03	00
Between *Guernſey*, and *Caskets* SE and NW	09	00
Thwart of *Guernſey* in the Channel, S E by S and N W by N.	09	45
In the *Chamber*, and *Goereeend*, S by E and N by W	11	15
H		
Before the *Hever*, before *Horn*, and at *Hampton-Key*, N. and S	12	00
Under *Holy Iſland*, and at *Horn*, NNE and SSW.	01	30
Before *Hartlepool*, N E and SW.	03	00
At *Huntcliff-foot*, NE. by E and SW by W	03	45
At *Humber*, E by N. & W by S	05	15
Before *Hamborough*, at *Hull*, at the *Holms*, and before *Humber's Mouth*, E and W	06	00
At *Harlem*, *Havre deGrace*, and *Homehead*, SE and NW.	09	00
At St. *Hellens*, at *Harwich*, and without the Banks of *Harwich*, SSE and NNW	10	30
At *Harwich* within, S by E. and N W	11	15
I		
At *Jutland* Iſlands N and S	12	00
On the Weſt Coaſt of *Ireland*, NE and SW	03	00
In all the Havens of the South Coaſt of *Ireland*, E by N and W by S	05	15
K		
Kentiſh Knock, N and S	12	00
At *Kelliers*, NE and SW	03	00
At *Kingſale* ENE. & WSW.	04	30
At *Kilduyn*, ESE. and WNW	07	30
At *Kildive*, SE. and NW	09	00
L		
At *Leith*, N. and S	12	00
At *Lisbon*, N E. by N. and S W by S	02	15
At *London*, NE and SW	03	00
Thwart of *Londey*, and before *Lin*, E by N. and W by S.	05	15
At *Lin* half Tide, at *Londey*, E and W	06	00
At *Lin*, E by S and W by N	06	45

	H	M
At the *Lizard* by the Land, ESE and WNW	07	30
At *Lambay*, S E by E. and N W by W.	08	15
At *Leyſtaff*, and thwart of it without the Banks, S E by S. and NW by N.	09	45
In *Leyſtaff* Road, and at *Longſand-head*, SSE and NNW	10	30
M		
Within the *Maes*, at *Maldon* N by E and S by W	00	45
Before the *Maes*, NNE. and SSW.	01	30
At the *Maes*, and before St. *Matthews* Point, NE by E. and S W by W.	03	45
In *Mouſehole*, at St. *Matthews*, and within *Mounts-bay*, ENE and WSW	04	30
In *Milford*, at *Moonleſs* at St. *Maloes*, E by N and W by S.	05	15
Between *Mouſehole* and *Falmouth* and in *Milford-Haven*, ESE and WNW	07	30
In St. *Magnes* Sound, and at *Magnes* Caſtle, SE by E and NW by W	08	15
At the *Iſle of Man*, SE. & NW	09	00
Before *Margate*, S by E and N by W	11	15
N		
At *Newport* Half-tide N & S	12	00
At the Weſt-end of the *Nore*, N by E. and S by W	00	45
Before the River of *Nantz*, NE and SW	03	00
At *Newcaſtle*, E by N & W by S	05	15
Before St. *Nicholas*, E by S and W by N	06	45
At the *Needles*, at the *Iſle of Wight*, SE by E and N W by W	08	15
All the Coaſt of *Normandy*, and *Picardy*, SSE. and NNW.	10	30

	H.	M
Between the *Naze* and *Warhead* of *Lower*, S by E & N by W	11	15
O		
At *Orkneſs*, NE. and SW	03	00
At *Orkney*, SE and NW	09	00
At *Orfordneſs*, SE by S and N W by N	09	45
At *Orfordneſs*, without the Banks, and between *Orford* and *Orwell Waves*, SSE & NNW	10	30
At *Orfordneſs*, within the *Sands*, S by E and N by W	11	15
P		
At *Portſmouth* Half-Tide, N and S.	12	00
At the *Pens*, *Porthus* and *Poictu*, N E and SW.	03	00
On the Coaſt of *Portugal* NE by E ane SW by W	03	45
In *Plymouth*, and before St. *Pauls*, E by N and W by S	05	15
At St. *Pauls* in the Haven, E and W.	06	00
Before *Podeſſemeck*, E by S and W by N	06	45
Thwart of *Plymouth*, E S E and WNW.	07	30
At the Race of *Portland*, SE and NW	09	00
Q		
At *Quinborough*, N and S	12	00
R		
At *Rocheſter*, N by E & S by W	00	45
At *Ramkins*, NNE & SSW	01	30
At *Rotterdam* in *Robin Hood's* Bay, and from the Race to the *Pole-head*, NE. and SW	03	00
At *Rouen*, and before *Rochel*, NE by E and SW by W	03	45
In *Ramſey*, E by N & W by S	05	15
S		
In the *Sleeve* between *Uſhant* and *Scilly*, at the *Shoe*, at the		

	H	M
Spits, at *Southampton*, and along the *Swin*, N. and S. ——	12	00
Upon the Coaſt of *Spain*, and in *Shetland*, N.E. and SW. —	03	00
At *Scilly* in the *Sound Scarburgh* & at *Staples* NE by E & SW by W	03	45
At *Seven Iſles*, without the Haven, in the broad *Sound*, E N E and WSW. ———	04	30
At the mouth of *Severn* between *Scilly* & the *Lizard*, at the *Spurn* & *Stockton*, E. by N. & W by S.	05	15
Without *Scilly*, in the Channel, and at *Salcomb*, E. and W.	06	00
At *Sedmouth*, and at the *Start*, E by S. and W by N. ——	06	45
Off the *Start* in the Channel, E S E. and W N W. ——	07	30
Within the *Seyn*, and before *Shelberg*, at 7 *Clifts*, SE. & NW	09	00
At *Sharam*, SE by S & NW by W	09	45
At *Seyn-head*, SSE. & NNW	10	30
T		
Within *Tervere*, N by E and S. by W. ——————	00	45
Before *Tervere*, before the River of *Thames*, and at *Tinmouth*, NNE. and SSW. -	01	30
Before the *Tees* and *Tinmouth*, before the Bay of *Tinmouth*, N E and S W ———	03	00
At the *Clifts* of the *Texel*, ENE and WSW ———	04	30
In *Torbay* and before the *Texel*, E and W. ——	06	00
In the Road of the *Texel*, ESE. and WNW. ——	07	30
At *Torgen*, SE by S. and N W by N ————	09	45
U		
Before *Ureck*, N. and S. —	12	00
At *Uſe*, N E and S W ——	03	00
Between *Uſhant* and the Main, NE by E. and SW by W.	03	45
In the *Vourd*, at the Bay, within *Uſhant*, ENE and WSW	04	30
Without *Uſhant*, E and W	06	00
St. *Vallery*, SSE. and NNW.	10	30
W		
At *Winchelſea*, N by E and S by W. ————	00	45
At the *Weilings*, and from the Weſt end of the *Wight*, NNE. and SSW. ———	01	30
Before the *Weilings*, NE by N. and S W by S. ——	02	15
At *Whitby* N E and S W—	03	00
In the Sea of *Wales* and *Severn*, E N E and WSW——	04	30
In *Wales*, E by N. & W by S	05	15
At *Wells*, at *Weymouth*, and at *Waterford*, E and W ——	06	00
At *Weymouth* Key, E by S. and W. by N. ———	06	45
At the *Neſs*, by *Wieringhen*, at *Winterton*, ESE. and WNW.	07	30
Thwart of the Iſle of *Wight*, in the Channel, all within the Iſle of *Wight*, between the Iſle of *Wight* and *Beachy*, by the ſhore, SE by E and NW by W.	08	15
At the Eaſt end of the *Wight*, and on *Wieringhen* Flats, S E. and NW. ————	09	00
Y		
Before *Yarmouth*, NNE and S S W ————	01	30
At *Youghall*, ENE and W SW ————	04	30
At *Yarmouth*, SE by E and NW by W. ———	08	15
In *Yarmouth-Road*, in *Yarmouth* Haven, SSE. and NNW	10	30
Z		
On the Coaſt of *Zealand*, NNE and SSW. ——	01	30
In the *Zerick Sea*, NE & SW	03	00

THE foregoing Table ſhews the Time of Full Sea at the ſeveral Places therein contained, upon the Full and Change Days of the Moon, which for more ready Uſe is put in Alphabetical Order.

Example. Admit the Time of Full Sea at *London*, upon the Full and Change Days required,

Look into the Table under the Letter (L) it is found to flow at *London* North Eaſt and South Weſt; that is when it is Full Sea at *London*, the Moon will be, as 'tis vulgarly ſaid, upon the North Eaſt and South Weſt Points of the Compaſs, which, as the Compaſs ſhews, is 3 Hours.

The Uſe of this, together with the Moon's Southing, to find the time of Full Sea at any Time, at any of the ſaid Places ſhall be ſhewn below.

To find the Moon's Southing.

To find the Southing of the Moon, multiply the Moon's Age by 4 and divide the Product by 5, and the Quotient is the Time of Southing in Hours, and the Remainder is ſo many 12 min. of an Hour.

Note, If the Moon's Age exceed 15, reject the ſaid 15, and take the Remainder, with which proceed inſtead of the Moon's Age, and it gives her Southing in the Morning.

Example. Suppoſe the Time of the Moon's Southing be required on the 25th of *November* 1746. The Moon's Age was found to be 23 Days, rejecting 15, the Remainder is 8, which multiplied by 4 makes 32, which divided by 5, gives the Quotient 6 Hours 24 Minutes, which is the Time of the Moon's Southing, which was required.

I ſhall here add a Table of the Moon's Southing to every Day of her Age.

Moon's Age.		Time H	M
1	16	0	48
2	17	1	36
3	18	2	24
4	19	3	12
5	20	4	00
6	21	4	48
7	22	5	36
8	23	6	24
9	24	7	12
10	25	8	00
11	26	8	48
12	27	9	36
13	28	10	24
14	29	11	12
15	30	12	00

The Uſe of the TABLE.

The firſt and ſecond Column ſhews the Moon's Age, the third the Southing.

Example.

The Moon being 9 Days old, and her Southing required.

In the firſt Column under the Title Moon's Age ſtands 9; over againſt it in the laſt Column is 7 Hours 12 Minutes, the Time of the Southing required.

Note alſo, the ſame Southing ſerves for 24 Days old, as ſerves for 9 Days, as the Table ſhews.

Thus having got the Moon's Southing, proceed to find the Time of Full Sea, as follows.

Suppoſe the Moon being 9 Days old, the Time of Full Sea in the *Downs* is required.

By the foregoing Table it appears that a N. N. W. and S. S. E. Moon makes Full Sea, which as the Table ſhews, is 10 Hours 30 Minutes; to which adding the Moon's Southing at 9 Days old, (*viz.* 7 Hours 12 Minutes,) it makes 17 Hours 42 Minutes, or 9 Hours 42 Minutes, rejecting 12 Hours in the Morning.

But to be more exact uſe the following Table and Directions.

Moon's Age.		Time H	M
1	16	0	43
2	17	1	20
3	18	1	52
4	19	2	22
5	20	2	52
6	21	3	26
7	22	4	07
8	23	4	55
9	24	5	50
10	25	6	53
11	26	7	59
12	27	9	04
13	28	10	08
14	29	11	05
15	30	00	00

Having found the Time of Full Sea, upon the Full and Change Days, by the preceding Table for that Purpoſe, enter this Table with the Moon's Age; againſt which in the laſt Column are the Hours and Minutes to be added for the time of Full Sea deſired.

Example.

Suppoſe as before, the Moon being 9 Days old, and the Time of Full Sea in the *Downs* is required.

A NNW. and SSE. Moon makes Full Sea upon the Full and Change Days, which is 10 hours 30 min. which being found, enter the Table with the Moon's Age 9 Days, againſt which ſtands 5 hours 50min. which added to 10 hours 30min. makes 16 hours 20min. or 4hours 20min. (rejecting 12 hours) in the Morning.

Here follows

A New and Exact KALENDAR.

O F

The Golden Number, Epact and Moveable Feaſts; as alſo of the Sun's Place and Declination to every Day of the Year, for the Firſt, Second, Third, and Leap-Years, newly calculated and made to ſerve (without any ſenſible Error) till the Year 1761. Likewiſe the Sun's Riſing, whereby may be found the Time of Setting, and Length of the Day and Night; together with the Southing of the Principal Fixed Stars at Midnight.

A Table of the Dominical Letters, Cycle *of the* Sun, Prime, Epact, *and* Moveable Feaſts, *for* 24 *Years to come.*

Years.	Dom. Letter	Cycle of ⊙	Prime	Epact.	Shove-Sunday.		Eaſter-Sunday.		Whit-Sunday.	
1738	A	11	10	20	*February*	12	*April*	2	*May*	21
1739	G	12	11	1	*March*	4		22	*June*	10
1740	FE	13	12	12	*February*	17		6	*May*	25
1741	D	14	13	23		8	*March*	29		17
1742	C	15	14	4		28	*April*	18	*June*	6
1743	B	16	15	15	*February*	13	*April*	3	*May*	22
1744	AG	17	16	26		5	*March*	25		13
1745	F	18	17	7		24	*April*	14	*June*	2
1746	E	19	18	18		9	*March*	30	*May*	18
1747	D	20	19	29	*March*	1	*April*	19	*June*	7
1748	CB	21	1	11	*February*	21	*April*	10	*May*	29
1749	A	22	2	22		5	*March*	26		14
1750	G	23	3	3		25	*April*	15	*June*	3
1751	F	24	4	14		17		7	*May*	26
1752	ED	25	5	25		9	*March*	29		17
1753	C	26	6	6	*February*	21	*April*	11	*May*	30
1754	B	27	7	17		13		3	*May*	22
1755	A	28	8	28	*March*	5		23	*June*	11
1756	GF	01	9	9	*February*	25		14	*June*	2
1757	E	02	10	20		9	*March*	30	*May*	18
1758	D	3	11	1	*March*	1	*April*	19	*June*	7
1759	C	4	12	12	*February*	21		11	*May*	30
1760	BA	5	13	23		6	*March*	26		14
1761	G	6	14	4	*February*	25	*April*	15	*June*	3

Jan.

January hath XXXI Days.

Month Days	Week Days	Remarkable days, and fouthing of Stars at Midnight	First Year 1737 1741 1745 1749 ☉ pla		☉ dec		Second Year 1738 1742 1746 1750 ☉ pla		☉ dec		Third Year 1739 1743 1747 1751 ☉ pla		☉ dec		Leap Year 1740 1744 1748 1752 ☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♑		South		♑		South		♑		South		♑		South	
1	[illegible]	Circumcision	22	22	21	37	22	07	21	40	21	52	21	42	21	38	21	44
2	[illegible]	Sun r. 8. 0.	23	23	21	27	23	08	21	30	22	53	21	32	22	39	21	35
3	[illegible]		24	24	21	17	24	09	21	19	23	55	21	22	23	40	21	24
4	[illegible]		25	25	21	06	25	10	21	08	24	56	21	11	24	41	21	14
5	[illegible]		26	26	20	54	26	12	20	57	25	57	21	00	25	42	21	03
6	[illegible]	Epiphany.	27	28	20	42	27	13	20	45	26	58	20	48	26	43	20	51
7	[illegible]		28	29	20	30	28	14	20	33	27	59	20	36	27	44	20	39
8	[illegible]		29	30	20	18	29	15	20	21	29	00	20	24	28	45	20	27
9	[illegible]	*Sol in Aqua,*	♒	31	20	05	♒	16	20	08	♒	01	20	11	29	46	20	14
10	[illegible]		01	32	19	51	01	17	19	55	01	02	19	58	♒	47	20	01
11	[illegible]		02	33	19	38	02	18	19	41	02	03	19	44	01	48	19	48
12	[illegible]		03	34	19	24	03	19	19	27	03	04	19	30	02	49	19	34
13	[illegible]	Sun r. 7. 44.	04	35	19	09	04	20	19	13	04	05	19	16	03	50	19	20
14	[illegible]		05	36	18	54	05	21	18	58	05	06	19	02	04	51	19	05
15	[illegible]		06	37	18	39	06	22	18	43	06	07	18	47	05	52	18	50
16	[illegible]		07	38	18	24	07	23	18	28	07	08	18	31	06	53	18	35
17	[illegible]		08	38	18	08	08	24	18	12	08	09	18	16	07	54	18	20
18	[illegible]		09	39	17	51	09	25	17	56	09	10	18	00	08	55	18	04
19	[illegible]		10	40	17	36	10	25	17	40	10	11	17	44	09	56	17	48
20	[illegible]		11	41	17	19	11	26	17	23	11	12	17	27	10	57	17	31
21	[illegible]	Sun r. 7. 30.	12	42	17	02	12	27	17	06	12	12	17	10	11	58	17	14
22	[illegible]		13	43	16	44	13	28	16	49	13	13	16	53	12	58	16	57
23	[illegible]		14	43	16	27	14	29	16	31	14	14	16	35	13	59	16	40
24	[illegible]		15	44	16	09	15	30	16	13	15	15	16	18	15	00	16	22
25	[illegible]	Co. St. *Paul*	16	45	15	51	16	30	15	55	16	16	16	00	16	01	16	04
26	[illegible]		17	46	15	32	17	31	15	36	17	16	15	41	17	02	15	46
27	[illegible]		18	46	15	14	18	31	15	18	18	17	15	23	18	04	15	27
28	[illegible]		19	47	14	55	19	32	14	59	19	18	15	04	19	03	15	08
29	[illegible]		20	48	14	35	20	33	14	40	20	18	14	45	20	04	14	49
30	[illegible]	K. Charles M.	21	48	14	16	21	34	14	21	21	19	14	25	21	04	14	30
31	[illegible]		22	49	13	56	22	34	14	01	22	20	14	26	22	05	14	11

February hath XXVIII Days.

Week Days	Month Days	Remarkable days, and ſouthing of Stars at Midnight	First 1737 1745		Year 1741 1749		Second 1838 1746		Year 1742 1750		Third 1739 1747		Year 1743 1751		Leap 1740 1748		Year 1744 1752	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♒		South		♒		South		♒		South		♒		South	
1	D	Purif. *Mary*	23	50	13	36	23	35	13	41	23	20	13	46	23	05	13	51
2	E	Lyon's Heart	24	50	13	16	24	35	13	21	24	21	13	26	24	06	13	31
3	F		25	51	12	56	25	36	13	01	25	21	13	06	25	07	13	11
4	G		26	51	12	35	26	37	12	40	26	22	12	45	26	07	12	50
5	A	Lyon's Neck	27	52	12	14	27	37	12	19	27	22	12	24	27	08	12	29
6	B	Sun r. 7. 1.	28	52	11	53	28	37	11	58	28	23	12	03	28	08	12	09
7	C	*Sol* in *Piſces.*	29	53	11	32	29	38	11	37	29	23	11	42	29	09	11	[illegible]
8	D		♓	53	11	11	♓	38	11	16	♓	24	11	21	♓	09	11	26
9	E		01	53	10	49	01	39	10	55	01	24	11	06	01	09	11	[illegible]
10	F		02	54	10	28	02	39	10	33	02	24	10	38	02	10	10	[illegible]
11	G		03	54	10	06	03	39	10	11	03	25	10	16	03	10	10	22
12	A		04	54	09	44	04	40	09	49	04	25	09	54	04	10	10	00
13	B	Sun r. 6 45.	05	55	09	22	05	40	09	27	05	25	09	32	05	11	09	[illegible]
14	C	*Valentine.*	06	55	08	59	06	40	09	05	06	26	09	10	06	11	09	16
15	D	Lower of the	07	55	08	37	07	40	08	42	07	26	08	48	07	11	08	[illegible]
16	E	two foremoſt in □ of great	08	55	08	14	08	40	08	20	08	26	08	25	08	11	08	31
17	F	Bear.	09	55	07	52	09	41	07	57	09	26	08	03	09	11	08	[illegible]
18	G		10	55	07	29	10	41	07	35	10	26	07	40	10	12	07	[illegible]
19	A		11	55	07	06	11	41	07	12	11	26	07	17	11	12	07	[illegible]
20	B		12	55	06	43	12	41	06	49	12	26	06	54	12	12	07	[illegible]
21	C	Sun r. 6. 29.	13	55	06	20	13	41	06	26	13	26	06	31	13	12	[illegible]	[illegible]
22	D		14	55	05	57	14	41	06	03	14	26	06	08	14	12	[illegible]	[illegible]
23	E		15	55	05	34	15	41	05	39	15	26	05	45	15	12	[illegible]	51
24	F	St *Matthias.*	16	55	05	10	16	41	05	16	16	26	05	22	16	12	05	[illegible]
25	G		17	55	04	47	17	41	04	53	17	26	04	58	17	12	05	04
26	A		18	55	04	24	18	40	04	29	18	26	04	35	18	11	04	41
27	B		19	55	04	00	19	40	04	06	19	26	04	12	19	11	04	17
28	C		20	55	04	37	20	40	03	42	20	26	03	48	20	11	03	54
29	D		When it is Leap Year *February* hath 29 Days												21	11	03	30

March hath XXXI Days.

March Days	Week Days	Remarkable days, and southing of Stars at Midnight.	First Year 1737 1741 1745 1749				Second Year 1738 1742 1746 1750				Third Year 1739 1743 1747 1751				Leap Year 1740 1744 1748 7152			
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♓		South		♓		South		♓		South		♓		South	
1	D	David	21	54	03	13	21	40	03	19	21	25	03	24	22	11	03	07
2	E	Lion's Tail	22	54	02	49	22	40	02	55	22	25	03	01	23	10	02	43
3	F	Lower of two	23	54	02	26	23	39	02	31	23	25	02	37	24	10	02	19
4	G	latter in □ of Great Bear	24	53	02	02	24	39	02	08	24	24	02	14	25	10	01	56
5	A		25	53	01	38	25	39	01	44	25	24	01	50	26	09	01	32
6	B		26	53	01	15	26	38	01	20	26	24	01	26	27	09	01	08
7	C		27	52	00	51	27	38	00	57	27	23	01	02	28	08	00	45
8	D		28	52	00	27	28	37	00	33	28	23	00	39	29	08	00	21
9	E	Sun r. 6. 0.	29	51	00	04	29	37	00	06	29	22	00	15	♈	07	Nor.	03
10	F		♈	50	Nor.	20	♈	36	Nor.	14	♈	22	Nor.	09	01	07	00	27
11	G	Upper of two	01	50	00	44	01	36	00	38	01	21	00	32	02	06	00	50
12	A	latter in □ of Great Bear.	02	49	01	07	02	35	01	02	02	20	00	56	03	05	01	14
13	B		03	49	01	31	03	34	01	25	03	20	01	20	04	05	01	37
14	C		04	48	01	55	04	33	01	49	04	19	01	43	05	04	02	01
15	D		05	47	02	18	05	32	02	12	05	18	02	07	06	03	02	25
16	E		06	46	02	42	06	32	02	36	06	18	02	30	07	03	02	48
17	F	Sun r. 5. 14.	07	46	03	05	07	31	02	59	07	17	02	54	08	02	03	11
18	G		08	45	03	28	08	30	03	23	08	16	03	17	09	02	03	35
19	A		09	44	03	52	09	30	03	46	09	15	03	40	10	00	03	58
20	B		10	43	04	15	10	29	04	09	10	14	04	04	10	59	04	21
21	C	Laſt but two	11	42	04	38	11	28	04	33	11	13	04	27	11	58	04	44
22	D	in Great	12	41	05	01	12	27	04	56	12	12	04	50	12	57	05	07
23	E	Bears Tail	13	40	05	24	13	26	05	19	13	11	05	13	13	56	05	30
24	F	Sun r. 5. 30.	14	39	05	47	14	25	05	42	14	10	05	36	14	55	05	53
25	G	Lady Day.	15	38	06	10	15	24	06	04	15	09	05	59	15	54	06	16
26	A		16	37	06	33	16	23	06	27	16	08	06	22	16	53	06	39
27	B		17	36	06	55	17	21	06	50	17	07	06	44	17	52	07	01
28	C	*Virgins Spike.*	18	34	07	18	18	20	07	12	18	06	07	07	18	51	07	24
29	D	Laſt but one	19	33	07	40	19	19	07	34	19	04	07	30	19	49	07	46
30	E	in Great	20	32	08	02	20	18	07	57	20	04	07	51	20	48	08	08
31	F	Bears Tail.	21	31	08	24	21	17	08	19	21	02	08	13	21	47	08	30

April hath XXX Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight	First 1737 1745		Year 1741 1749		Second 1738 1746		Year 1742 1750		Third 1739 1747		Year 1743 1751		Leap 1740 1748		Year 1744 1752	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♈		South		♈		North		♈		North		♈		North	
1	G	Sun r. 5. 16.	22	29	08	46	22	15	08	41	22	01	08	35	22	45	08	5
2	A		23	28	09	08	23	14	09	03	23	00	08	57	23	44	09	14
3	B		24	27	09	29	24	12	09	24	23	59	09	19	24	42	09	35
4	C	Laſt in Great *Bear's Tail*	25	25	09	51	25	11	09	46	24	57	09	41	25	41	09	57
5	D		26	24	10	12	26	10	10	07	25	55	10	02	26	40	10	18
6	E	Sun r. 5 6.	27	22	10	33	27	08	10	28	26	54	10	23	27	38	10	39
7	F		28	21	10	54	28	07	10	49	27	53	10	44	28	37	11	00
8	G		29	22	11	15	29	05	11	10	28	51	11	05	29	35	11	21
9	A		♉	18	11	36	♉	04	11	31	29	49	11	26	♉	34	11	41
10	B		01	16	11	56	01	02	11	51	♉	48	11	46	01	32	12	02
11	C	*Dragon's Tail*	02	15	12	16	02	00	12	12	01	46	12	07	02	30	12	22
12	D	*Arcturus*	03	13	12	36	02	59	12	32	02	45	12	27	03	29	12	42
13	E		04	11	12	56	03	57	12	52	03	43	12	47	04	27	13	02
14	F		05	09	13	16	04	55	13	11	04	41	13	06	05	25	13	21
15	G		06	08	13	35	05	54	13	31	05	39	13	26	06	24	13	41
16	A	Sun r. 4. 48.	07	06	13	54	06	52	13	50	06	37	13	45	07	22	14	00
17	B		08	04	14	13	07	50	14	09	07	36	14	04	08	20	14	19
18	C		09	02	14	32	08	48	14	28	08	34	14	23	09	18	14	37
19	D		10	00	14	51	09	46	14	46	09	32	14	42	10	16	14	56
20	E	Southermoſt Scale in *Libra*	10	58	15	09	10	44	15	04	10	30	15	00	11	14	15	14
21	F		11	57	15	27	11	42	15	22	11	28	15	18	12	12	15	32
22	G	Sun r. 4. 37.	12	55	15	45	12	41	15	40	12	26	15	36	13	10	15	49
23	A	St. George	13	53	16	02	13	39	15	58	13	24	15	54	14	08	16	07
24	B		14	51	16	19	14	37	16	15	14	22	16	11	15	06	16	24
25	C	St. *Mark* Ev.	15	49	16	36	15	35	16	32	15	20	16	28	16	04	16	41
26	D	Upper of two	16	46	16	53	16	32	16	49	16	18	16	45	17	02	16	57
27	E	foremoſt in □	17	44	17	09	17	30	17	06	17	16	17	01	18	00	17	14
28	F	of *Little Bear*	18	42	17	25	18	28	17	21	18	14	17	17	18	58	17	30
29	G		19	40	17	41	19	26	17	37	19	12	17	33	19	56	17	45
30	A	N. Scale of ♎	20	38	17	57	20	25	17	53	20	10	17	49	20	54	18	01

May hath XXXI Days.

[illegible]	[illegible]	Remarkable days, and ſouthing of Stars at Midnight.	First		Year		Second		Year		Third		Year		Leap		Year	
			1737 1745		1741 1749		1738 1746		1742 1750		1739 1747		1743 1751		1740 1748		1744 7152	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♉		North		♉		North		♉		North		♉		North	
1	[illegible]	Phil. and Jac.	21	36	18	12	21	22	18	08	21	08	18	04	21	52	18	16
2	[illegible]	Sun r. 4. 21.	22	34	18	27	22	20	18	23	22	06	18	19	22	49	18	31
3	[illegible]	Brighteſt in	23	31	18	41	23	17	18	38	23	03	18	34	23	47	18	45
4	[illegible]	the Crown.	24	29	18	56	24	15	18	52	24	01	18	49	24	45	18	59
5	[illegible]	Brighteſt in	25	27	19	10	25	13	19	06	24	59	19	03	25	43	19	13
6	[illegible]	Sepents neck	26	24	19	23	26	10	19	20	25	57	19	17	26	40	19	27
7	[illegible]		27	22	19	37	27	08	19	33	26	55	19	30	27	38	19	40
8	[illegible]		28	20	19	50	28	06	19	46	27	52	19	43	28	36	19	53
9	[illegible]	Scorpions	29	17	20	02	29	03	19	59	28	50	19	56	29	33	20	06
10	[illegible]	Forehead.	♊	15	20	14	♊	01	20	11	29	47	20	09	♊	31	20	18
11	[illegible]	Sun r. 4.8.	01	13	20	26	00	59	20	23	♊	45	20	21	01	28	20	30
12	[illegible]		02	10	20	38	01	56	20	35	01	42	20	32	02	26	20	41
13	[illegible]		03	08	20	49	02	54	20	47	02	40	20	44	03	23	20	52
14	[illegible]	Scorpions	04	05	21	00	03	51	20	58	03	37	20	55	04	21	21	03
15	[illegible]	Heart.	05	02	21	11	04	49	21	08	04	35	21	06	05	18	21	14
16	[illegible]		06	00	21	21	05	46	21	18	05	32	21	16	06	16	21	24
17	[illegible]		06	59	21	31	06	44	21	28	06	30	21	26	07	13	21	33
18	[illegible]		07	56	21	40	07	42	21	38	07	27	21	36	08	11	21	43
19	[illegible]		08	53	21	49	08	39	21	47	08	25	21	45	09	09	21	52
20	[illegible]	Sun r. 3. 57.	09	50	21	58	09	36	21	56	09	22	21	54	10	06	22	00
21	[illegible]		10	47	22	06	10	33	22	04	10	20	22	02	11	03	22	08
22	[illegible]		11	45	22	14	11	31	22	13	11	17	22	10	12	01	22	16
23	[illegible]		12	42	22	22	12	29	22	20	12	14	22	18	12	58	22	24
24	[illegible]		13	40	22	29	13	26	22	27	13	12	22	25	13	56	22	31
25	[illegible]		14	37	22	36	14	23	22	34	14	09	22	32	14	54	22	37
26	[illegible]		15	34	22	42	15	20	22	41	15	07	22	39	15	50	22	44
27	[illegible]	Sun r. 3. 53.	16	32	22	48	16	18	22	47	16	04	22	45	16	47	22	50
28	[illegible]		17	29	22	54	17	16	22	52	17	01	22	51	17	45	22	55
29	[illegible]	K.C. 2B &R.	18	26	22	59	18	13	22	58	17	58	22	57	18	42	23	00
30	[illegible]		19	23	23	04	19	10	23	02	18	56	23	02	19	39	23	05
31	[illegible]		20	20	23	08	20	07	23	07	19	53	23	06	20	36	23	09

June hath XXX Days.

Month Days	Week Days	Remarkable days, and fouthing of Stars at Midnight.	First 1737 1745 ☉ pla		Year 1741 1749 ☉ dec		Second 1738 1746 ☉ pla		Year 1742 1750 ☉ dec		Third 1739 1747 ☉ pla		Year 1743 1751 ☉ dec		Leap 1740 1748 ☉ pla		Year 1744 1752 ☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♊		North		♊		North		♊		North		♊		North	
1	E	Sun r. 3. 50.	21	18	23	12	21	04	23	11	20	50	23	10	21	34	23	13
2	F		22	15	23	15	22	01	23	14	21	48	23	14	22	31	23	16
3	G		23	12	23	19	22	59	23	18	22	45	23	17	23	28	23	19
4	A		24	10	23	22	23	56	23	21	23	42	23	20	24	25	23	22
5	B		25	07	23	24	24	53	23	23	24	39	23	23	25	23	23	24
6	C		26	04	23	25	25	50	23	25	25	37	23	25	26	20	23	26
7	D		27	01	23	27	26	48	23	27	26	34	23	27	27	17	23	27
8	E		27	59	23	28	27	45	23	28	27	31	23	28	28	14	23	28
9	F		28	56	23	29	28	42	23	29	28	28	23	28	29	12	23	29
10	G	Sun r. 3. 47.	29	53	23	29	29	39	23	29	29	25	23	29	♋	09	23	29
11	A		♋	50	23	29	♋	36	23	29	♋	23	23	29	01	06	23	29
12	B		01	47	23	28	01	34	23	28	01	20	23	29	02	03	23	28
13	C		02	45	23	27	02	31	23	28	02	17	23	28	03	00	23	27
14	D		03	42	23	26	03	28	23	26	03	14	23	27	03	58	23	25
15	E		04	39	23	24	04	25	23	25	04	11	23	25	04	55	23	23
16	F		05	36	23	22	05	22	23	23	05	09	23	23	05	52	23	21
17	G	Brightest in	06	33	23	19	06	20	23	20	06	06	23	21	06	49	23	18
18	A	the Harp.	07	31	23	16	07	17	23	17	07	03	23	18	07	46	23	15
19	B		08	28	23	13	08	14	23	14	08	00	23	14	08	44	23	12
20	C		09	25	23	09	09	11	23	10	08	57	23	11	09	41	23	08
21	D	Sun r. 3. 50.	10	22	23	05	10	08	23	06	09	54	23	07	10	38	23	03
22	E		11	19	23	00	11	05	23	01	10	52	23	02	11	35	22	59
23	F		12	16	22	55	12	03	22	56	11	49	22	57	12	32	22	53
24	G	John Baptist.	13	14	22	49	13	00	22	51	12	46	22	52	13	29	22	48
25	A		14	11	22	44	13	58	22	45	13	43	22	47	14	27	22	42
26	B		15	08	22	37	14	55	22	39	14	40	22	40	15	24	22	36
27	C		16	05	22	31	15	52	22	32	15	37	22	34	16	21	22	29
28	D		17	02	22	24	16	49	22	25	16	35	22	27	17	18	22	22
29	E	Peter Apostle	18	00	22	16	17	46	22	18	17	32	22	20	18	15	22	14
30	F		18	57	22	08	18	43	22	10	18	29	22	12	19	13	22	06

July hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	First		Year		Second		Year		Third		Year		Leap		Year	
			1737		1741		1738		1742		1739		1743		1740		1744	
			1745		1749		1746		1750		1747		1751		1748		1752	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♋		North		♋		North		♋		North		♋		North	
1	G	Sun r. 3.57.	19	54	22	00	19	40	22	02	19	26	22	04	20	10	21	58
2	A		20	51	21	52	20	37	21	54	20	24	21	56	21	07	21	49
3	B		21	48	21	43	21	35	21	45	21	22	21	47	22	04	21	40
4	C		22	46	21	33	22	32	21	36	22	18	21	38	23	02	21	31
5	D	Brighteſt be-	23	43	21	24	23	29	21	26	23	15	21	29	23	59	21	21
6	E	tween the	24	40	21	14	24	26	21	16	24	13	21	19	24	56	21	11
7	F	Eaglesſhould	25	37	21	03	25	24	21	06	25	10	21	08	25	53	21	01
8	G		26	35	20	53	26	21	20	55	26	07	20	58	26	50	20	50
9	A		27	32	20	42	27	18	20	44	27	04	20	47	27	48	20	36
10	B		28	29	20	30	28	15	20	33	28	02	20	36	28	45	20	26
11	C	Sun r. 4. 8.	29	27	20	18	29	13	20	21	28	59	20	24	29	42	20	13
12	D		♌	24	20	06	♌	10	20	09	29	56	20	12	♌	40	20	02
13	E		01	21	19	54	01	07	19	57	♌	54	20	00	01	37	19	50
14	F		02	19	19	41	02	05	19	44	01	51	19	47	02	34	19	37
15	G		03	16	19	28	03	02	19	31	02	48	19	34	03	32	19	24
16	A	Sun r. 4. 16.	04	13	19	14	03	59	19	18	03	46	19	21	04	29	19	10
17	B		05	11	19	00	04	57	19	04	04	43	19	07	05	27	18	56
18	C	Swan's Tail	06	08	18	46	05	54	18	50	05	40	18	53	06	24	18	42
19	D	Dog days beg.	07	06	18	32	06	52	18	35	06	38	18	39	07	21	18	28
20	E		08	03	18	17	07	49	18	21	07	35	18	24	08	19	18	13
21	F	Sun r. 4. 23.	09	00	18	02	08	47	18	06	08	33	18	10	09	16	17	58
22	G		09	58	17	47	09	44	18	51	09	30	17	54	10	14	17	43
23	A		10	55	17	31	10	42	17	35	10	28	17	39	11	12	17	27
24	B		11	53	17	15	11	39	17	19	11	25	17	23	12	09	17	11
25	C	James Apoſtle	12	50	16	59	12	37	17	03	12	23	17	07	13	06	16	55
26	D	Sun r. 4. 30.	13	48	16	43	13	34	16	47	13	20	16	51	14	04	16	38
27	E		14	46	16	26	14	32	16	30	14	18	16	34	15	01	16	22
28	F		15	43	16	09	15	29	16	13	15	15	16	17	15	59	16	05
29	G		16	41	15	52	16	27	15	56	16	13	16	00	16	56	15	47
30	A		17	38	15	35	17	24	15	39	17	10	15	43	17	54	15	30
31	B		18	36	15	17	18	22	15	21	18	08	15	25	18	52	15	12

Auguſt hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Firſt		Year		Second		Year		Third		Year		Leap		Year	
			1737		1741		1738		1742		1739		1743		1740		1744	
			1745		1749		1746		1750		1747		1751		1748		1752	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♌		North		♌		North		♌		North		♌		North	
1	C	Lammas	15	33	14	5[illegible]	19	20	15	03	19	05	15	07	19	49	14	54
2	D		20	31	14	41	20	17	14	45	20	03	14	49	20	47	14	36
3	E		21	29	14	22	21	15	14	27	21	01	14	31	21	45	14	17
4	F		22	27	14	03	22	13	14	08	21	59	14	12	22	43	13	58
5	G		23	25	13	44	23	11	13	49	22	57	13	54	23	40	13	39
6	A		24	22	13	25	24	08	13	30	23	55	13	35	24	38	13	20
7	B	Sun r. 4 50.	25	20	13	06	25	06	13	11	24	52	13	15	25	36	13	01
8	C		26	18	12	46	26	04	12	51	25	50	12	56	26	34	12	41
9	D		27	16	12	27	27	02	12	31	26	48	12	36	27	32	12	21
10	E		28	14	12	07	28	00	12	12	27	46	12	16	28	29	12	01
11	F		29	12	11	47	28	58	11	51	28	43	11	56	29	27	11	41
12	G	*Sol* in *Virgo*	♍	09	11	26	29	55	11	31	29	41	11	36	♍	25	11	21
13	A		01	07	11	06	♍	53	11	11	♍	39	11	16	01	23	11	00
14	B		02	05	10	45	01	51	10	50	01	37	10	55	02	21	10	39
15	C		03	03	10	24	02	49	10	29	02	35	10	34	03	19	10	1
16	D	Sun r. 5. 8.	04	01	10	03	03	47	10	08	03	33	10	13	04	17	09	57
17	E		04	59	09	42	04	45	09	47	04	31	09	52	05	15	09	36
18	F		05	58	09	21	05	44	09	26	05	29	09	31	06	13	09	15
19	G		06	56	08	59	06	42	09	04	06	28	09	09	07	12	08	53
20	A		07	54	08	37	07	40	08	43	07	26	08	48	08	10	08	31
21	B	Fomelhaut	08	52	08	16	08	38	08	21	08	24	08	26	09	08	08	10
22	C	Sun r. 5. 19.	09	50	07	54	09	36	07	59	09	22	08	04	10	06	07	48
23	D		10	48	07	32	10	34	07	37	10	20	07	42	11	04	07	26
24	E	Barthol. Apo.	11	47	07	09	11	32	07	15	11	18	07	20	12	03	07	03
25	F	Firſt in *Pegaſus* Wing.	12	45	06	47	12	30	06	53	12	17	06	58	13	02	06	41
26	G		13	43	06	25	13	29	06	30	13	15	06	36	13	59	06	19
27	A	Sun r. 5 29.	14	42	06	02	14	28	06	08	14	13	06	14	14	58	05	56
28	B	Dog days end	15	40	05	40	15	26	05	45	15	12	05	51	15	56	05	33
29	C	Dec. J. R.	16	38	05	17	16	24	05	22	16	10	05	28	16	54	05	10
30	D		17	37	04	54	17	23	05	00	17	09	05	05	17	53	04	48
31	E		18	36	04	31	18	21	04	37	18	07	04	42	18	51	04	25

September h[illegible] XXX Days.

Week Days	Month Days	Remarkable days, and ſouthing of Stars at Midnight.	First 1737 1745		Year 1741 1749		Second 1738 1746		[illegible]ear 1742 1750		Third 1739 1747		Year 1743 1751		Leap 1740 1748		Year 1744 1752	
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♍		North		♍		North		♍		North		♍		North	
1	F	Sun r. 5. 38.	19	34	04	08	19	20	04	14	19	06	04	19	19	50	04	02
2	G	*Lond.* burnt 66	20	32	03	45	20	18	03	51	20	04	03	56	20	48	03	39
3	A		21	31	03	22	21	17	03	28	21	03	03	32	21	47	03	16
4	B		22	30	02	59	22	15	03	05	22	02	03	09	22	46	02	53
5	C		23	28	02	36	23	14	02	41	23	00	02	47	23	45	02	29
6	D		24	27	02	13	24	13	02	18	23	59	02	24	24	43	02	06
7	E		25	26	01	49	25	11	01	55	24	57	02	01	25	42	01	43
8	F		26	24	01	26	26	10	01	32	25	56	01	37	26	40	01	19
9	G		27	23	01	02	27	09	01	08	26	55	01	14	27	39	00	56
10	A		28	22	00	39	28	08	00	45	27	53	00	50	28	38	00	32
11	B	*Androm.* *Head*	29	21	00	16	29	07	00	21	28	52	00	27	29	37	00	09
12	C	Sun r. 6. 0.	≏	20	Sou.	08	≏	05	Sou.	02	29	51	00	04	≏	35	Sou.	1
13	D		01	19	00	31	01	04	00	26	≏	50	Sou.	20	01	35	00	3
14	E		02	18	00	55	02	03	00	49	01	49	00	43	02	34	01	01
15	F	End of *Pega-*	03	17	01	18	03	02	01	13	02	48	01	07	03	33	01	2
16	G	*ſus* Wing.	04	16	01	42	04	01	01	36	03	47	01	31	04	32	01	4
17	A		05	15	02	05	05	00	02	00	04	46	01	54	05	31	02	12
18	B		06	14	02	29	05	59	02	23	05	45	02	17	06	30	02	35
19	C		07	13	02	52	06	58	02	46	06	44	02	41	07	29	02	5
20	D	Sun r. 6. 16.	08	12	03	15	07	58	03	10	07	43	03	04	08	28	03	22
21	E	Matthew Ev.	09	11	03	39	08	57	03	33	08	42	03	28	09	27	03	45
22	F		10	10	04	02	09	56	03	56	09	42	03	51	10	26	04	0
23	G	Pole Star.	11	10	04	25	10	55	04	20	10	41	04	14	11	26	04	32
24	A		12	09	04	49	11	54	04	43	11	40	04	37	12	25	04	55
25	B	Southermoſt	13	08	05	12	12	54	05	06	12	39	05	01	13	24	05	18
26	C	in *Andromeda's*	14	08	05	35	13	53	05	29	13	39	05	24	14	24	05	41
27	D	Girdle.	15	07	05	58	14	52	05	52	14	38	05	47	15	23	06	0
28	E		16	06	06	21	15	52	06	15	15	38	06	10	16	23	06	27
29	F	Sun r. 6. 30.	17	06	06	44	16	51	06	38	16	37	06	33	17	22	06	50
30	G		18	05	07	06	17	51	07	01	17	36	06	55	18	21	07	1

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight	First Year 1737 1741 1745 1749				Second Year 1738 1742 1746 1750				Third Year 1739 1743 1747 1751				Leap Year 1740 1744 1748 1752			
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♎		South		♎		South		♎		South		♎		South	
1	[illegible]	Sun r. 6. 38.	19	05	07	29	18	50	07	23	18	36	07	18	19	20	07	35
2	[illegible]		20	04	07	52	19	50	07	46	19	35	07	41	20	20	07	58
3	[illegible]		21	04	08	14	20	49	08	08	20	35	08	03	21	20	08	[illegible]
4	[illegible]		22	04	08	37	21	49	08	31	21	35	08	26	22	20	08	43
5	[illegible]		23	03	08	59	22	49	08	53	22	34	08	48	23	20	09	05
6	[illegible]		24	03	09	21	23	48	09	15	23	34	09	10	24	19	09	27
7	[illegible]		25	03	09	43	24	48	09	37	24	34	09	32	25	19	09	49
8	[illegible]		26	02	10	04	25	48	09	59	25	33	09	54	26	19	10	10
9	[illegible]		27	02	10	26	26	48	10	21	26	33	10	16	27	19	10	[illegible]
10	[illegible]	*Andromeda's*	28	02	10	48	27	48	10	43	27	33	10	37	28	18	10	[illegible]
11	[illegible]	Southermoſt	29	02	11	09	28	47	11	04	28	33	10	59	29	18	11	[illegible]
12	[illegible]	Foot.	♏	02	11	30	29	47	11	25	29	33	11	20	♏	18	11	[illegible]
13	[illegible]	Sun r. 7. 4.	01	02	11	51	♏	47	11	46	♏	33	11	41	01	18	11	[illegible]
14	[illegible]		02	02	12	12	01	47	12	07	01	33	12	02	02	18	12	[illegible]
15	[illegible]		03	02	12	33	02	47	12	28	02	33	12	23	03	18	12	[illegible]
16	[illegible]		04	02	12	53	03	47	12	48	03	33	12	43	04	18	12	[illegible]
17	[illegible]	*Luke* Evan.	05	02	13	13	04	47	13	08	04	33	13	04	05	18	13	[illegible]
18	[illegible]		06	02	13	33	05	47	13	28	05	33	13	24	06	18	13	[illegible]
19	[illegible]		07	02	13	53	06	47	13	48	06	33	13	44	07	18	13	[illegible]
20	[illegible]		08	02	14	13	07	48	14	08	07	33	14	03	08	19	14	[illegible]
21	[illegible]		09	02	14	32	08	48	14	27	08	33	14	23	09	19	14	[illegible]
22	[illegible]		10	03	14	52	09	48	14	47	09	33	14	42	10	19	14	[illegible]
23	[illegible]		11	03	15	10	10	48	15	06	10	34	15	01	11	19	15	[illegible]
24	[illegible]		12	03	15	29	11	48	15	24	11	34	15	20	12	19	15	[illegible]
25	[illegible]	Sun r. 7 . 24.	13	03	15	47	12	49	15	43	12	34	15	38	13	20	15	[illegible]
26	[illegible]		14	04	16	05	13	49	16	[illegible]	13	34	15	57	14	20	[illegible]	10
27	[illegible]		15	04	16	22	14	49	16	19	14	35	16	15	15	20	16	[illegible]
28	[illegible]	*Simon* & *Jude*	16	04	16	40	15	50	16	37	15	35	16	32	16	21	16	45
29	[illegible]		17	05	16	58	16	50	16	54	16	36	16	50	17	21	17	[illegible]
30	[illegible]		18	05	17	15	17	51	17	11	17	36	17	07	18	22	17	[illegible]
31	[illegible]	Sun r. 7. 33.	19	06	17	32	18	51	17	28	18	36	17	24	19	22	17	36

November hath XXX Days.

Remarkable days, and Sun-rising of Sun at Midnight.	First Year				Second Year				Third Year				Leap Year			
	1737 1745		1741 1749		1738 1746		1742 1750		1739 1747		1743 1751		1740 1748		174 7152	
	☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
	D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
	♏		South		♏		South		♏		South		♏		South	
All Saints	20	06	17	48	19	52	17	44	19	37	17	40	20	23	17	53
Sun r. 7. 36.	21	07	18	04	20	52	18	00	20	37	17	56	21	23	18	08
	22	07	18	20	21	53	18	16	21	38	18	12	22	24	18	24
K. W Nat.	23	08	18	35	22	53	18	32	22	38	18	28	23	24	18	40
Powder Plot	24	08	18	50	23	54	18	47	23	39	18	43	24	25	18	55
	25	09	19	05	24	54	19	02	24	40	18	58	25	25	19	09
	26	10	19	20	25	55	19	16	25	40	19	13	26	26	19	24
	27	10	19	34	26	56	19	30	26	41	19	27	27	27	19	38
	28	11	19	48	27	56	19	44	27	42	19	41	28	28	19	[illegible]
	29	12	19	01	28	57	19	58	28	42	19	54	29	28	20	[illegible]
Martin B.	♐	13	20	14	29	58	20	11	29	43	20	07	♐	29	20	17
	01	13	20	27	♐	59	20	24	♐	44	20	20	01	30	20	30
Sun r. 7. 53.	02	14	20	39	01	59	20	36	01	45	20	33	02	31	20	[illegible]
	03	15	20	51	03	00	20	48	02	45	20	45	03	31	20	[illegible]
	04	16	21	02	04	01	20	59	03	46	20	57	04	32	21	[illegible]
[illegible]	05	17	21	13	05	02	21	10	04	47	21	08	05	33	21	[illegible]
	06	17	21	24	06	03	21	21	05	48	21	19	06	34	21	27
	07	18	21	34	07	04	21	32	06	49	21	29	07	35	21	37
	08	19	21	44	08	04	21	42	07	50	21	39	08	36	21	47
	09	20	21	53	09	05	21	51	08	51	21	49	09	37	21	[illegible]
	10	21	22	03	10	06	22	00	09	52	21	58	10	38	22	[illegible]
	61	22	22	11	11	07	22	09	10	52	22	07	11	39	22	[illegible]
	12	23	22	19	12	08	22	17	11	53	22	15	12	40	22	21
Sun r. 8. 5.	13	24	22	27	13	09	22	25	12	54	22	23	13	41	22	[illegible]
Capella, or	14	25	22	34	14	10	22	33	13	55	22	31	14	42	22	36
the Goat.	15	26	22	41	15	11	22	40	14	56	22	38	15	43	22	[illegible]
Orion's Left	16	27	22	48	16	12	22	46	15	58	22	45	16	44	22	[illegible]
Foot.	17	28	22	54	17	13	22	52	16	59	22	51	17	45	22	[illegible]
Bull's Horn.	18	29	22	59	18	14	22	58	18	00	22	57	18	46	23	[illegible]
St. Andrew Ap.	19	30	23	04	19	15	23	03	19	01	23	02	19	47	23	[illegible]

December hath XXXI Days.

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	First Year 1737 1741 1745 1749				Second Year 1738 1742 1746 1750				Third Year 1739 1743 1747 1751				Leap Year 1740 1744 1748 1752			
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♐		South		♐		South		♐		South		♐		South	
1	F	First in *Orion's* Belt.	20	31	23	09	20	17	23	08	20	02	23	08	20	48	23	10
2	G		21	32	23	13	21	18	23	12	21	03	23	11	21	49	23	14
3	A	Last in *Orion's* Belt.	22	34	23	16	22	19	23	16	22	04	23	15	22	50	23	17
4	B		23	35	23	19	23	20	23	19	23	05	23	18	23	51	23	20
5	C	*Orion's* right shoulder, and *Auriga's* right shoulder.	24	36	23	22	24	21	23	22	24	06	23	21	24	52	23	2
6	D		25	37	23	24	25	22	23	24	25	07	23	24	25	54	23	25
7	E		26	38	23	26	26	23	23	26	26	08	23	26	26	55	23	27
8	F		27	39	23	28	27	24	23	27	27	10	23	27	27	56	23	2
9	G		28	41	23	29	28	26	23	28	28	11	23	28	28	57	23	29
10	A		29	42	23	29	29	27	23	29	29	12	23	29	29	58	23	2
11	B	Shortest Day.	♑	43	23	29	♑	28	23	29	♑	13	23	29	♑	59	23	2
12	C		01	44	23	28	01	29	23	28	01	14	23	29	02	00	23	2
13	D	Foot of the Great Dog.	02	45	23	27	02	30	23	28	02	15	23	28	03	02	23	27
14	E		03	46	23	26	03	31	23	26	03	16	23	27	04	03	23	25
15	F	Bright Star of *Gemini*.	04	48	23	24	04	33	23	24	04	18	23	25	05	04	23	2
16	G		05	49	23	21	05	34	23	22	05	19	23	23	06	05	23	2
17	A	Sun r. 8. 11.	06	50	23	18	06	35	23	19	06	20	23	20	07	06	23	1
18	B	Mouth of the Great Dog, or *Syrius*.	07	51	23	15	07	36	23	16	07	21	23	17	08	08	23	1
19	C		08	52	23	11	08	37	23	12	08	22	23	13	09	09	23	1
20	D		09	53	23	07	09	38	23	08	09	24	23	09	10	10	23	0
21	E	*Thomas* Ap.	10	54	23	02	10	40	23	03	10	25	23	04	11	11	23	01
22	F		11	56	22	57	11	41	22	58	11	26	22	59	12	12	22	55
23	G	Sun r. 8. 8.	12	57	22	51	12	42	22	53	12	27	22	54	13	13	22	49
24	A		13	58	22	45	13	43	22	47	13	28	22	48	14	15	22	43
25	B	Nat. *Christ.*	14	59	22	38	14	44	22	40	14	29	22	42	15	16	22	37
26	C	*St. Stephen.*	16	00	22	31	15	45	22	33	15	31	22	35	16	17	22	29
27	D	*John* Evan.	17	01	22	24	16	47	22	26	16	32	22	28	17	18	22	22
28	E	*Innocents*	18	03	22	16	17	48	22	18	17	33	22	20	18	19	22	14
29	F	Castor.	19	04	22	08	18	49	22	10	18	34	22	12	19	20	22	05
30	G	Pollux.	20	05	21	59	19	50	22	01	19	35	22	03	20	21	21	56
31	A	Sun r 8. 1.	21	06	21	49	20	51	21	52	20	36	21	54	21	22	21	47

A Table of the Variation of the Sun's Declination to every 15 Degrees of Longitude from the Meridian of *London.*

Degrees of Longitude from the Meridian of London.

Daily Variat.	Deg 15	Deg 30	Deg 45	Deg 60	Deg 75	Deg 90	Deg 105	Deg 120	Deg 135	Deg 150	Deg 165	Deg 180
Min.	min	min	min	min	min	min	min	min	min	min	min	min
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	01	01	01	01	01
4	00	00	00	01	01	01	01	01	02	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	03	03	03	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	06
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	07
15	01	01	02	02	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	08
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	01	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	07	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	03	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
24	01	02	03	04	05	06	07	08	09	10	11	12

Explanation of the Kalendar.

In every Page there is 11 Columns, the firſt ſhews the Day of the Month, the ſecond the Day of the Week, expreſſed by the Letters A, B, C, *&c.* the third the Southing of ſeveral Stars at Midnight, at which time the ſaid Stars are to be obſerved, thereby to find the Latitude; in the ſame Column is given the time of Sun-riſing (and by ſubtracting the time of riſing from 12 Hours, gives the time of ſetting) the eight following Columns ſhew the Sun's Place and Declination for the Firſt, Second Third, and Leap-Year, according to their reſpective Titles.

For the more ready knowing of Leap-Year, the following Table is inſerted, where it is found by Inſpection, as alſo follow the Firſt, Second, or Third Years after Leap-Year.

Firſt Year	Second Year	Third Year	Leap Year
1737	1738	1739	1740
1741	1742	1743	1744
1745	1746	1747	1748
1749	1750	1751	1752
1753	1754	1755	1756
1757	1758	1759	1760
1761	1762	1763	1764
1765	1766	1767	1768

The Uſe of the Kalendar.

To find the Day of the Week, or Month, for any Time paſt, or to come, by the Kalendar.

Firſt, find the Dominical Letter for the Year, then proceed as follows.

Example 1. Suppoſe it was required to find what Day of the Month will be the third *Wedneſday* in *March*, 1746.

Having found the Dominical Letter by the Directions in Page 22, or by the Table in Page 39, to be E, turn to the Month of *March*, and account E for *Sunday*, then the Letter A is for *Wedneſday*, and the third *Wedneſday* is the 19th of *March*, which was required.

Example 2. What Day of the Week will the ſecond of *September* be on in the Year 1744.

This Year being Leap-Year has two Dominical Letters, A and G; the firſt Letter, to wit A, ſerving from the firſt of *January* to the end of *February*; the laſt Letter, to wit G, ſerves from thence to the Year's-end.

Wherefore looking againſt the ſecond of *September*, there ſtands G, which repreſents *Sunday*, the Day of the Week required.

Note, That the *Gregorian*, or *Foreign* Account, begins 11 Days before ours; ſo that our firſt of *January* is their 12th; our 12th their 23d; our 23d their 3d of *February*; our 24th of *February* is their 7th of *March*: But in Leap-Year our 24th of *February* is their 6th of *March*, becauſe then *February* hath 29 Days.

To find the Sun's Place and Declination by the Kalendar.

Example 1. Suppoſe the Sun's Place and Declination be required on the 10th of *January* 1741, being the firſt after Leap-year.

In the Month of *January*, in the firſt Column look the Day of the Month, over againſt which, under the firſt Year ſtands 1.32, that is, the Sun's Place is in 1 deg 32 min. of *Aquarius*: In the next Column under the ſaid Year ſtands 19.51, under the Title South, which ſhews the Declination to be 19 deg. 51 min. Southerly; and this ſerves for the Year 1741; on the ſaid 10th of *January*, being the firſt after Leap-year.

Example 2. Suppoſe the Sun's Place and Declination to be required on the 10th of *March*, 1744, being Leap-year.

In the Month of *March*, in the firſt Column find the Day of the Month, over-againſt which, under Leap-year, ſtands 1.07, which ſhews the Sun's Place to be 1 deg. 07 min. of *Aries*; and in the next Column under Leap-year ſtands 00.27, which ſhews the Declination to be 27 min. Northerly, which was required.

Although it is common to take the Declination as it is in the Kalendar, yet if the Difference of Longitude be conſiderable from *London*, it is requiſite the Declination ſhould be corrected, becauſe in the Kalendar it is calculated to the Meridian of *London*, for which end the *Table of the Variation of the Sun's Declination to every* 15 *Degrees of Longitude from the Meridian of London*, immediately following the Kalendar is added; the Uſe and Explanation whereof follows.

IN the firſt Column is the daily Varition, which is found by ſubtracting the Declination of the given Day of the Month, from the Declination for the Day following; or contrarily this from that, that is the leſſer from the greater, and the Difference is the daily Variation. In the Head of the other Columns are Degrees of Longitude from *London*, either Eaſterly or Weſterly, and in thoſe Columns under the reſpective deg. of Longitude, are the Minutes of Declination, anſwerable to the daily Variation. As ſuppoſe the daily Variation were 10 min. and the Difference of Longitude 90 deg. againſt 10 in the firſt Column, and under 90 deg. at the Head of the Table, ſtands 2 Minutes, which anſwers thereto, and are to be uſed as follows.

The Uſe of the Table of the Variation of the Sun's Declination.

The Rule, Firſt, If the Difference of Longitude be Weſterly, and the Declination increaſing, the Variation found in this Table muſt be added to the Declination found in the Kalendar; but if the Declination be decreaſing, it muſt be ſubtracted therefrom.

Secondly, If the Difference of Longitude be Eaſterly, and the Declination increaſing, the Variation aforeſaid muſt be ſubtracted; but the Declination decreaſing muſt be added.

Examp. 1. *April* the 19th, 1744, being at Sea, the difference of Longitude from the Meridian of *London* being 90 degrees Weſterly, I find the

Declination in the Kalendar to be 14 deg. 56 min. North; and the 20th Day, the Declination is 15 deg. 14 min. therefore ſubtracting the leſſer Declination from the greater, the Remainder is 18 min. which is the daily Increaſe. Then in the Table under 90 deg. and over-againſt 18, ſtands 4 min. which (becauſe the Difference of Longitude is Weſterly, and the Declination increaſing) muſt be added to 14 deg. 56 min. before found, which makes the true Declination 15 deg. 00 min. North.

If the Difference of Longitude in this Caſe had been Eaſterly, the 4 min. found in the Table muſt have been ſubtracted.

Note, It is eaſily diſcerned, whether the Declination increaſe or decreaſe, by obſerving whether the Declination for the Day following be greater or leſſer; for if it be greater, then it increaſes; but if leſs, then it decreaſes.

Examp. 2. *January* the 10th 1741, being at Sea, the difference of Longitude from *London* being 120 deg. Weſterly, I find the Declination in the Kalendar to be 19 deg. 51 min. South, and the 11th Day it is 19 deg. 38 min. therefore ſubtracting the leſſer from the greater, the Difference is 13 min. which is the daily decreaſe; then in this Table under 120 deg. and againſt 13 ſtands 4 min. which (becauſe the Difference of Longitude is Weſterly, and the Declination decreaſing) muſt be ſubtracted, which makes the true Declination 19 deg. 47 min South. If the difference of Longitude had been Eaſterly, the 4 min. muſt have been added.

The Uſe of the Sun's Declination to find the Latitude.

The Declination of the Sun is moſt uſeful at Sea, with the Complement of the Sun's Meridian Altitude (commonly called the *Zenith Diſtance*) taken with a Quadrant or Croſs-ſtaff, to find the Latitude of the Place; for which take the following Rules.

Rule 1. If the Sun comes to the Meridian in the South, and the Declination be North, then the Declination added to the Complement of the Meridian Altitude is the Latitude North.

Example. Suppoſe being at Sea, the 10th of *April*, 1740, the Declination found by the Table is 12 deg. 02 min. North, the Sun comes to the Meridian in the South; the Complement of the Meridian Altitude by Obſervation is 23 deg. 10 min. What is the Latitude?

Complement of the Meridian Altitude is —— 23° 10' South
Declination of the Sun is ———————— 12 02 North
The Latitude of the Place is ———————— 35 12 North

Rule 2. If the Sun comes to the Meridian in the North and hath North Declination, then ſubtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude North. But if the Complement of the Altitude exceed the Declination, ſubtract the Declination therefrom, and the Remainder is the Latitude South.

Example 1. Suppoſe being at Sea, *May* 20, 1744, the Declination being 22 deg. 00 min. North, the Sun comes to the Meridian in the North, and by obſerving with a Quadrant the Sun's Zenith Diſtance is 18 deg. 42 min. What is the Latitude of the Place?

Sun's Declination is ———————— 22° 00' North
Sun's Zenith diſtance ———————— 18 42 North

The Latitude is ———————— 3 18 North

Example 2. Suppoſe being at Sea, *June* 10th, 1745, the Sun's Declination by the Table is 23 deg. 29 min. North, the Complement of the Meridian Altitude, by Obſervation, is 33 deg. 10 min. the Sun comes to the Meridian in the North.

Sun's Complement Meridian Altitude is ——— 33° 10' North
Sun's Declination ———————— 23 20 North

The Latitude is ———————— 9 41 South

Rule 3. If the Sun comes to the Meridian in the North, and have South Declination, the Declination added to the Complement of the Altitude is the Latitude South.

Example 2. Suppoſe being at Sea, *January* 29th, 1748, the Sun comes to the Meridian in the North, the Complement of the Meridian Altitude is 22 deg. 10 min. What is the Latitude?

Complement Sun's Meridian Altitude is ——— 22° 10' North
Sun's Declination by the Table ——— 14 49 South

The Latitude is ———————— 36 59 South

Rule 4. If the Sun comes to the Meridian in the South, and have South Declination, ſubtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude South. But if the Complement of the Meridian Altitude exceed the Declination, ſubtract the Declination therefrom, the Remainder is the Latitude North.

Example 1. Suppoſe being at Sea, *January* 1ſt, 1740, the Sun coming to the Meridian in the South: The Complement of the Altitude is 10 deg. 36 min. What is the Latitude?

Sun's Declination ———————— 21° 44' South
Complement Meridian Altitude ——— 10 36 South

Latitude of the Place ———————— 11 08 South

Example 2. Suppoſe being at Sea, *February* 18, 1742, the Sun coming to the Meridian in the South, the Complement of the Meridian Altitude is 25 deg. 20 min. What is the Latitude?

Complement Sun's Meridian Altitude ——— 25° 20' South
Sun's Declination ———————— 07 35 South

Latitude ———————— 17 45 North

Rule 5. If the Sun be in the Zenith (that is right over head) if it have either North or South Declination, the Declination is the Latitude either North or South.

Rule 6. If the Sun have no Declination, the Complement of the Meridian Altitude is the Latitude which is North or South, according as the Ship is to the Northward or Southward of the Sun.

Days	Jan. ☉ Right Aſcen.		Februar. ☉ Right Aſcen.		March. ☉ Right Aſcen.		April. ☉ Right Aſcen.		May. ☉ Right Aſcen.		June. ☉ Right Aſcen.	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
1	19	36	21	43	23	29	01	22	03	15	05	20
2	19	40	21	47	23	33	01	26	03	19	05	24
3	19	44	21	51	23	37	01	30	03	23	05	28
4	19	49	21	55	23	40	01	34	03	27	05	32
5	19	53	21	59	23	44	01	37	03	31	05	37
6	19	57	22	03	23	47	01	41	03	35	05	41
7	20	01	22	07	23	51	01	45	03	39	05	45
8	20	05	22	11	23	54	01	48	03	43	05	49
9	20	09	22	15	23	58	01	52	03	47	05	53
10	20	14	22	18	00	02	01	52	03	51	05	57
11	20	18	22	22	00	06	01	59	03	55	06	01
12	20	23	22	26	00	09	02	03	03	59	06	05
13	20	27	22	30	00	13	02	07	04	03	06	09
14	20	31	22	34	00	16	02	11	04	07	06	13
15	20	35	22	37	00	20	02	14	04	11	06	18
16	20	39	22	41	00	24	02	18	04	15	06	22
17	20	43	22	45	00	27	02	22	04	19	06	27
18	20	47	22	49	00	31	02	26	04	23	06	30
19	20	51	22	53	00	34	02	30	04	27	06	34
20	20	55	22	56	00	38	02	33	04	31	06	39
21	20	59	23	00	00	42	02	37	04	35	06	43
22	21	04	23	04	00	45	02	41	04	39	06	47
23	21	08	23	07	00	49	02	45	04	43	06	51
24	21	12	23	11	00	53	02	49	04	47	06	55
25	21	16	23	15	00	56	02	52	04	51	06	59
26	21	20	23	18	01	00	02	56	04	55	07	03
27	21	24	23	22	01	04	03	00	04	59	07	07
28	21	28	23	26	01	07	03	04	05	03	07	11
29	21	32			01	11	03	08	05	07	07	15
30	21	36			01	15	03	11	05	12	07	20
31	21	39			01	18			05	16		

Days	July		Auguſt		Septem.		October		Novem.		Decem.	
	☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.	
	h.	m.	h.	m.	h,	m.	h.	m.	h.	m.	h.	m.
1	07	24	09	26	11	20	13	09	15	08	17	16
2	07	28	09	30	11	24	13	13	15	12	17	21
3	07	32	09	34	11	27	13	16	15	16	17	26
4	07	36	09	38	11	31	13	20	15	20	17	30
5	07	40	09	41	11	34	13	23	15	24	17	35
6	07	44	09	45	11	37	13	27	15	28	17	39
7	07	48	09	49	11	42	13	31	15	32	17	43
8	07	52	09	52	11	45	13	35	15	37	17	47
9	07	56	09	56	11	49	13	39	15	41	17	52
10	08	00	09	59	11	52	13	42	15	46	17	57
11	08	04	10	03	11	56	13	46	15	56	18	01
12	08	08	10	07	12	00	13	50	15	54	18	06
13	08	12	10	11	12	03	13	54	15	59	18	10
14	08	16	10	15	12	07	13	58	16	03	18	15
15	08	20	10	18	12	10	14	01	16	08	18	20
16	08	24	10	22	12	14	14	05	16	12	18	24
17	08	28	10	26	12	18	14	09	16	16	18	29
18	08	32	10	29	12	21	14	13	16	20	18	34
19	08	36	10	33	12	25	14	17	16	24	18	38
20	08	40	10	36	12	28	14	21	16	29	18	42
21	08	44	10	40	12	32	14	25	16	33	18	46
22	08	48	10	44	12	36	14	29	16	37	18	50
23	08	52	10	48	12	39	14	33	16	41	18	55
24	08	56	10	51	12	43	14	37	16	45	18	59
25	08	59	10	54	12	46	14	40	16	50	19	04
26	09	03	10	58	12	50	14	44	16	54	19	08
27	09	07	11	02	12	54	14	48	16	58	19	12
28	09	11	11	05	12	58	14	52	17	03	19	17
29	09	15	11	09	13	02	14	56	17	07	19	21
30	09	18	11	12	13	06	15	00	17	12	19	26
31	09	22	11	16			15	04			19	31

A TABLE, ſhewing the Right Aſcenſion, Declination, and Magnitude of the Principal Fixed Stars.

Names of the Stars.	Magnitude.	Right Aſcen. H. M.	Declination. D. M.	
POLE Star	2	00 32	87 51	N
Girdle of Andromeda	2	00 50	33 50	N
Bright Star of Aries	2	01 52	22 10	N
Meduſa's Head	2	02 49	39 54	N
Bright Side of Perſeus	2	03 05	48 52	N
Aldebaran, or Bull's Eye	1	04 18	15 55	N
Capella, or the Goat	1	04 55	45 41	N
Bright Foot of Orion	1	05 01	08 33	S
Middle Star in Orion's Belt	3	05 20	01 25	S
Orion's Right Shoulder	1	05 39	07 19	N
Auriga's Right Shoulder	2	05 44	44 53	N
Bright Foot of Gemini	2	06 19	16 38	N
Syrius, or the Great Dog	1	06 33	16 21	S
Caſtor, or Northermoſt Twin	2	07 16	32 27	N
Procyon, or the Little Dog	2	07 24	05 54	N
Pollux, or Southermoſt Twin	2	07 25	28 39	N
Hydra's Heart	1	09 14	07 29	S
Lyon's Heart, or Regulus	1	09 54	13 16	N
The Lower of the Pointers	2	10 41	57 50	N
The Upper of the Pointers	2	10 43	63 13	N
Lyon's Tail	1	11 31	16 05	N
Upper of the two laſt in the Square of the Great Bear	2	12 02	58 34	N
Laſt but two in the Great Bear's Tail	2	12 40	57 27	N
Virgin's Spike	1	13 11	09 44	S
Laſt but one in the Great Bear's Tail	2	13 10	56 21	N
Laſt in the Great Bear's Tail	2	13 34	50 42	N
Arcturus	1	14 02	20 38	N
South Ballance	2	14 32	14 54	S
Foremoſt Guard	2	14 51	75 15	N
Brighteſt of the Crown	2	15 21	25 38	N
Brighteſt in the Serpent's Neck	2	15 33	07 18	N
Antares, the Scorpion's Heart	1	16 12	25 47	S
Head of Hercules	3	17 02	14 43	N
Ophiucus, or Serpent's Head	3	17 22	12 47	N

Lyræ, or the Harp	1	18	27	38	33	N
Swan's Bill	3	19	17	27	29	N
Vulture, or Eagle's Heart	2	19	34	08	10	N
Swan's Tail	2	20	30	44	19	N
Mouth of Pegaſus	3	21	27	08	39	N
Fomelhaut	1	22	41	31	03	S
Marchab, or Pegaſus Wing	2	22	48	13	44	N
Scheat, or Pegaſus Leg	2	22	50	26	36	N
Cephus's Knee	3	23	20	76	07	N
Andromeda's Head	2	23	53	27	35	N
End of Pegaſus's Wing	2	23	57	13	39	N

The Explanation and Uſe of the TABLE *of the* Sun's Right Aſcenſion, *and of the* Table *of the* Star's Right Aſcenſion *and* Declination.

IN the Table of the *Sun's Right Aſcenſion*, the firſt Page contains the firſt ſix Month's of the Year; the next Page the other ſix Months; at the Head of the Table are the *Months*; in the firſt Column towards the Left Hand are the *Days of the Month*, and in the oppoſite Column is the *Right Aſcenſion in Hours and Minutes.*

In the Table of the *Fixed Stars*, there are four Columns; in the firſt towards the Left-hand, are the *Names of the Stars*; in the ſecond, the *Star's Magnitude*; in the third, the *Right Aſcenſion in Hours and Minutes*; in the fourth, their Declination in Degrees and Minutes, North or South.

Firſt, To find the Time of the Star's coming upon the Meridian.

The Rule. Look the Right Aſcenſion of the Sun and Star, and ſubtract the Right Aſcenſion of the Sun from the Right Aſcenſion of the Star, but if the Star's Right Aſcenſion be leſs than the Sun's, add thereto 24 Hours, and then ſubtract; the Remainder after Subtraction, is the Time of the Star's coming upon the Meridian from Noon; but if the Remainder exceed 12 Hours, ſubtract 12 Hours therefrom, and then the Remainder is the Time from Midnight.

Example 1. Suppoſe the Time that *Fomelhaut* comes upon the Meridian on the 10th of *October* is required.

I find in the Table that Star's Right Aſcenſion to be 22 Hours 41 min. and the Sun's to be 13 Hours 42 min. which ſubtracted from the Star's Right Aſcenſion, leaves 8 Hours 59 min. the Time of the Star's coming upon the Meridian, Afternoon.

Example 2. Suppoſe the Time that the *Bull's Eye* comes upon the Meridian on the 15th of *October* were required.

I find the Star's Right Aſcenſion to be 4 Hours 18 min. the Sun's 14 Hour 1 min. Now becauſe the Sun's Right Aſcenſion is more than the Star's, add to the Star's Right Aſcenſion 24 Hours, which makes 28 Hours 18 min. from which ſubtracting the Sun's Right Aſcenſion 14 Hours 1 min. there remains 14 Hours 17 min. from which ſubtracting 12 Hours, there remains 2 Hours 17 min. which is the Time of the Star's Southing after Midnight, as was required.

Secondly, The Time being given, to find what Star will come to the Meridian about the ſame Time.

The Rule. To the Sun's Right Aſcenſion add the Time from Noon, at which the Star's coming to the Meridian is deſired; the Sum is the Right Aſcenſion of the Star that will come to the Meridian at that Time; with which enter the Table of the Star's Right Aſcenſion and Declination, where look what Star's Right Aſcenſion agrees with the Right Aſcenſion before found, or neareſt thereto, and that is the Star ſought for.

Example. Suppoſe *March* 27th, I deſire to know what Star will come upon the Meridian about 8 at Night.

The Sun's Right Aſcenſion is 1 Hour 4 Minutes; the Time from Noon is 8 Hours, which added to the Sun's Right Aſcenſion, makes 9 Hours 4 Minutes: The neareſt in the Table is *Hydra's Heart*, whoſe Right Aſcenſion is 9 Hours 14 Minutes, and therefore South's at 8 Hours 8 Minutes, and ſo in others.

Directions for Obſervations of the Stars, to find the Latitude of the Place.

Having before ſhewn how to find the Time of a Star's coming to the Meridian, I ſhall now ſhew by the Star's Altitude, how to find the Latitude.

Note, In North Latitude, thoſe Stars whoſe North Declination exceed the Complement of the Latitude may be obſerved under the Pole. And the ſame may be performed by the Southern Stars in South Latitude.

Directions for finding the Latitude, by the Meridional Altitude of the Fixed Stars.

Rule 1. If the Star comes to the Meridian in the South, and hath North Declination, the Complement of the Altitude (by Obſervation) added to the Declination of the Star, found in the Table of the Star's Right Aſcenſion and Declination, gives the Latitude North.

Example. On the 10th of *January*, being at Sea, I find by the foregoing Directions, that the *Lyon's Heart* comes to the Meridian in the South at 1 Hour 37 min. after Midnight, the Meridian Altitude by Obſervation was 63 Degrees; which ſubtracted from 90 Degrees, there remains 27 Degrees the Complement of the Altitude; to which adding 13 Degrees 16 Minutes the Declination of the Star North, gives 40 Degrees 16 Minutes the Latitude of the Place North, which was required.

Rule 2. If a Star comes to the Meridian in the South, and have South Declination, ſubtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude North. But if the Declination exceed the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, and the Remainder is the Latitude South.

Example 1. Suppoſe on the 10th of *July*, being at Sea, the Star *Fomelhaut* coming to the Meridian in the South, at 2 Hours 41 m. after Midnight, the *Merid. Alt.* 35 deg. 50 min. the Compl. whereof is 54 deg. 10 min. the Star's Declination is 31 deg. 03 min. South, which ſubtracted from the Complement of Alt. leaves 23 deg. 07 min. which is the Latitude North.

Example 2. Suppoſe on the 20th of *June*, being at Sea, the *Scorpion's Heart* comes to the Meridian in the South at 9 Hours 33 min. at Night, the Complement of the Altitude is 5 deg. 27 min. the Declination 25 Degrees 47 Minutes South; from which ſubtracting the Complement of the Altitude, there remains 20 deg. 20 min. which is the Latitude South.

Rule 3. If a Star comes to the Meridian in the North, above the Pole, and have North Declination, ſubtracting the Declination from the Complement of the Altitude, the Remainder is the Latitude South. But if the Declination exceeds the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, the Remainder is the Latitude North.

Example 1. On the 11th of *June* the *brighteſt in the Harp* comes to the Meridian in the North at 26 Minutes after Midnight, the Complement of the Altitude is 79 Degrees, from which ſubtracting the Declination, which is 38 deg. 33 min. North, there remains 40 Degrees 27 Minutes, which is the Latitude South.

Example 2. On the 11th of *September Andromeda's Head* comes to the Meridian in the N. at 8 min. after Midnight, the Complement of the Altitude is 7 deg. 10 min. which ſubtracted from the Declination 27 deg. 35 min. gives 20 deg. 25 min. which is the Latitude North.

Rule 4. If a Star comes to the Meridian in the North, and have South Declination, the Complement of the Altitude added to the Declination gives the Latitude South.

Example. On the 12th of *December*, *Syrius* (*or the great Dog's Mouth*) comes to the Meridian in the North at 26 Minutes after Midnight, the Complement of the Altitude is 30 deg. to which adding 16 deg. 20 min. the Declination South, gives 46 deg. 20 min. the Latitude South.

Rule 5. If a Star comes to the Meridian under the Pole, then add the Complement of the Declination to the Meridian Altitude, the Sum is the Latitude either North or South, according to the Star's Declination.

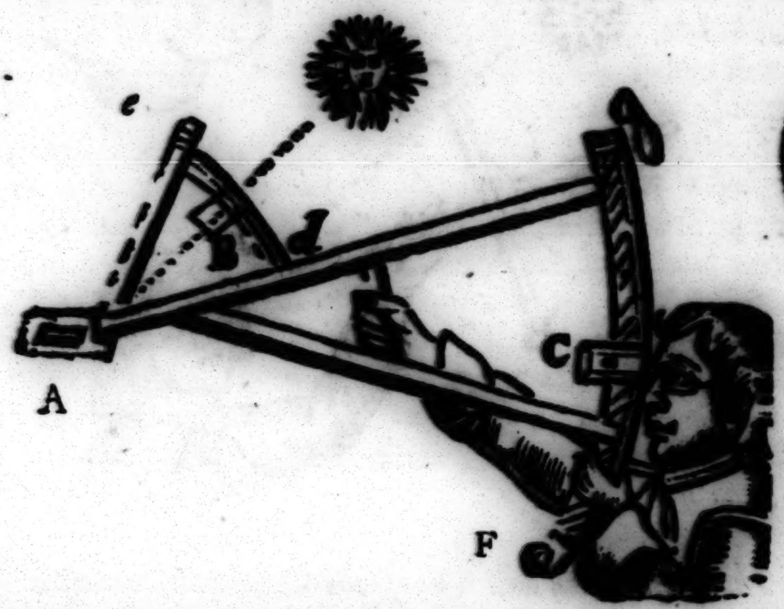
Example. On the 10th of *March*, the Pole Star comes to the Meridian under the Pole at 30 min. after Midnight, the Meridian Altitude 44 deg. 30 min. the Complement of the Declination 2 deg. 09 min. which added together gives 46 deg. 39 min. which is the Latitude North.

Rule 6. If the Star be in the Zenith, the Declination is the Latitude, either North or South, according to the Declination of the Star.

Rule 7. If the Star have no Declination, the Complement of the Meridian Altitude is the Latitude of the Place either North or South, according as the Star is either to the Northward or Southward.

The Deſcription and Uſe of the Sea-Quadrant.

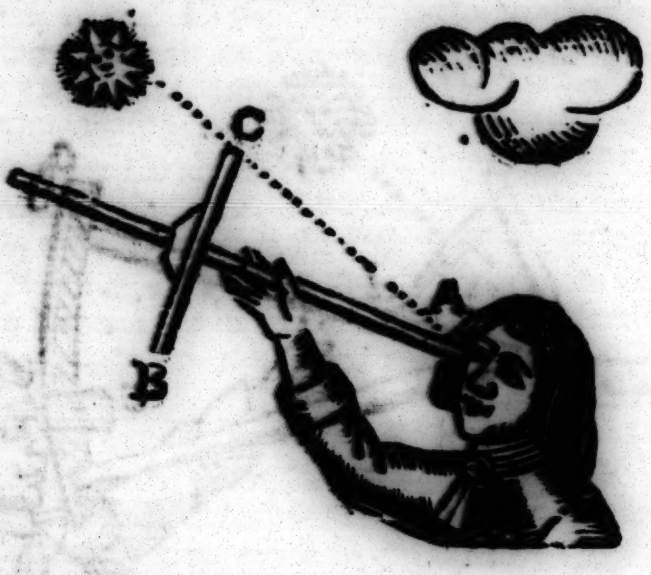
THIS Inſtrument conſiſts of three Vanes and two Arches, the Horizon Vane, which in obſerving, reſpects the Horizon, as at A. The Shade Vane, ſo called becauſe of its giving the Shadow upon the Horizon Vane in Time of Obſervation, as at B. Laſtly, the Sight Vane, which in Time of Obſervation is placed at the Eye, through which the Shadow and Horizon are ſeen, as at C. The leſſer of the Arches mark'd with *d e*, is called the *Sixty Arch*, becauſe it contains 60 (or more commonly of late 65) Degrees. In Time of Obſervation, the Shade Vane is placed upon this Arch always to an even Degree; it is numbred from the Upper-end at *e*, downward to *d*, with 5, 10, 15, 20, *&c.* The bigger Arch marked with *g* F, is called the *Thirty Arch*, becauſe it contains 30 (or rather 25) Degrees, it is divided into Degrees and Minutes.



The Uſe of this Inſtrument is to take the *Sun's* Meridian Altitude, which is done in the manner following.

Put the Horizon Vane upon the End of the Quadrant at A, the Shade Vane upon the Sixty (or leſſer Arch) to a Number of Degrees leſs than the Complement of the Altitude by 15 or 20d. and the Sight Vane upon the Thirty Arch. The Vanes being thus fixed upon the Quadrant, your Back being turned towards the *Sun*, and the Sight Vane placed to the Eye, look thro' the ſaid Sight Vane, and cauſe the Shadow of the upper Edge of the Shade Vane to fall upon the upper Part of the Slit in the Horizon Vane, where uſually (for Perſpicuity Sake) there is drawn a black Line; and if at the ſame Time the Horizon appear thro' the ſaid Slit in the Horizon Vane, that is the *Sun's* preſent Altitude; but if the Sea appear inſtead of the Horizon, then ſlide the Sight Vane lower towards F; if the Sky appear inſtead of the Horizon, then ſlide the Sight Vane a little higher, until the Horizon appear through the Horizon Vane. But to obtain the Meridian

Altitude, which is the greateſt Altitude the Sun will have that Day, and is the Thing uſed to find the Latitude, continue obſerving, and as the *Sun* riſes, the Sea will appear through the Horizon Vane; then muſt the Sight Vane be removed lower: And thus continue obſerving, as often as may be convenient, till the *Sun* be at the higheſt, which is the Meridian Altitude. When the *Sun* begins to fail, the Sky will appear inſtead of the Horizon, and then it's Time to give over obſerving for that Day. Having thus done, add the Degrees upon the Sixty Arch to the Degrees and Minutes upon the Thirty Arch, and the Sum is the Complement of the Meridian Altitude; the Uſe of which for finding the Latitude, is ſufficiently ſhewed in the preceding Rules.



The Deſcription and Uſe of the Croſs-ſtaff, *or* Fore-ſtaff.

THIS Inſtrument conſiſts of a Staff and four Croſſes, the firſt and ſhorteſt is called the Ten Croſs, and it belongs to that Side of the Staff which is numbred from about 3 Degrees to 10 Degrees. Sometimes the Thirty Croſs, and the reſt of the Croſſes are ſo made, as that the Breadth thereof, ſerves inſtead of this Ten Croſs.

The ſecond Croſs is called the Thirty Croſs, and belongs to that Side of the Staff which is numbred from about 10 Degrees to 30.

The third Croſs is called the Sixty Croſs, and belongs to that Side of the Staff which is numbred from about 20 to 60 Degrees.

The fourth and laſt Croſs is called the Ninety Croſs, and belongs to that Side of the Staff, which is numbred from about 30 to 90 Degrees.

This Staff is likewiſe numbred with the Complement to 90 Degrees, (*viz.*) at 10 ſtands 80, at 20 ſtands 70, at 30 ſtands 60; and ſo the reſt.

The Uſe of this Inſtrument is to take the Meridian Altitude of the *Sun* or *Stars*, which is done as followeth.

Firſt, Conſider how great the Sun's Meridian Altitude will be this Day; and accordingly uſe the Croſs moſt ſuitable (*viz*) if the Meridian Altitude be judged to be under 10 deg. uſe the Tenth Croſs; if between 10 and 30, the Thirty Croſs; if between 30 and 60, the Sixty Croſs; if between 60 and 90, the Ninety Croſs, which is ſeldom uſed.

Having put on the Croſs, place the flat End of the Staff at A, to the outſide of the Eye, as near as may be, without hindring the Sight: Thus the Face being towards the Sun or Star, hold the Croſs upright; then look at the upper End of the Croſs at C for the Sun or Star, and at the lower End at B for the Horizon, and if the Sea appears inſtead of the Horizon, remove the Croſs a little farther from the Eye; but if the Sky appear inſtead of the Horizon, remove the Croſs a little nearer to the Eye, until the Sun or Star appear at the upper End, and the Horizon at the lower End; which when they do, then upon the Side of the Staff belonging to the Croſs uſed in Obſervation, will be found the deg. and min. of Altitude of the Sun or Star. But the greateſt Altitude being that which is required, Obſervation muſt be continued as frequently as Judgment ſhall direct, until the Sun or Star be at the higheſt; and as the Sun or Star riſes, the Sky will appear inſtead of the Horizon; but when the Sun or Star is paſt the Meridian, and begins to fall, the Sea will appear inſtead of the Horizon, and then is the Obſervation finiſhed; and upon the ſide of the Staff proper to the Croſs uſed, are found the deg. and min. of the Sun's Meridian Altitude; which ſubtracted from 90 deg. gives the Complement of the Altitude; or it may be taken off the Staff at once (the Staff being numbred with the Complement as is ſhewed before) with which to proceed in finding the Latitude of the Place, obſerve the Rules and Directions aforegoing.

The Deſcription and Uſe of the Nocturnal.

IT conſiſts of three Parts, the firſt and unmoveable Part, on which is the Handle, by which to hold it in time Obſervation; upon the foreſide of which, in the outermoſt Circle, are the Days of the Month, and upon the innermoſt are ſet off the 24 Hours, and upon the Back-ſide are the 32 Points of the Compaſs.

There are two ſorts of *Nocturnals*, the one made for the *Great Bear*, the other for the *Little Bear*. Thoſe that are made for the *Great Bear* have *February* at the Top, but thoſe that are made for the *Little Bear* have *April*, but now they are commonly made for both *Bears*, having two Indexes.

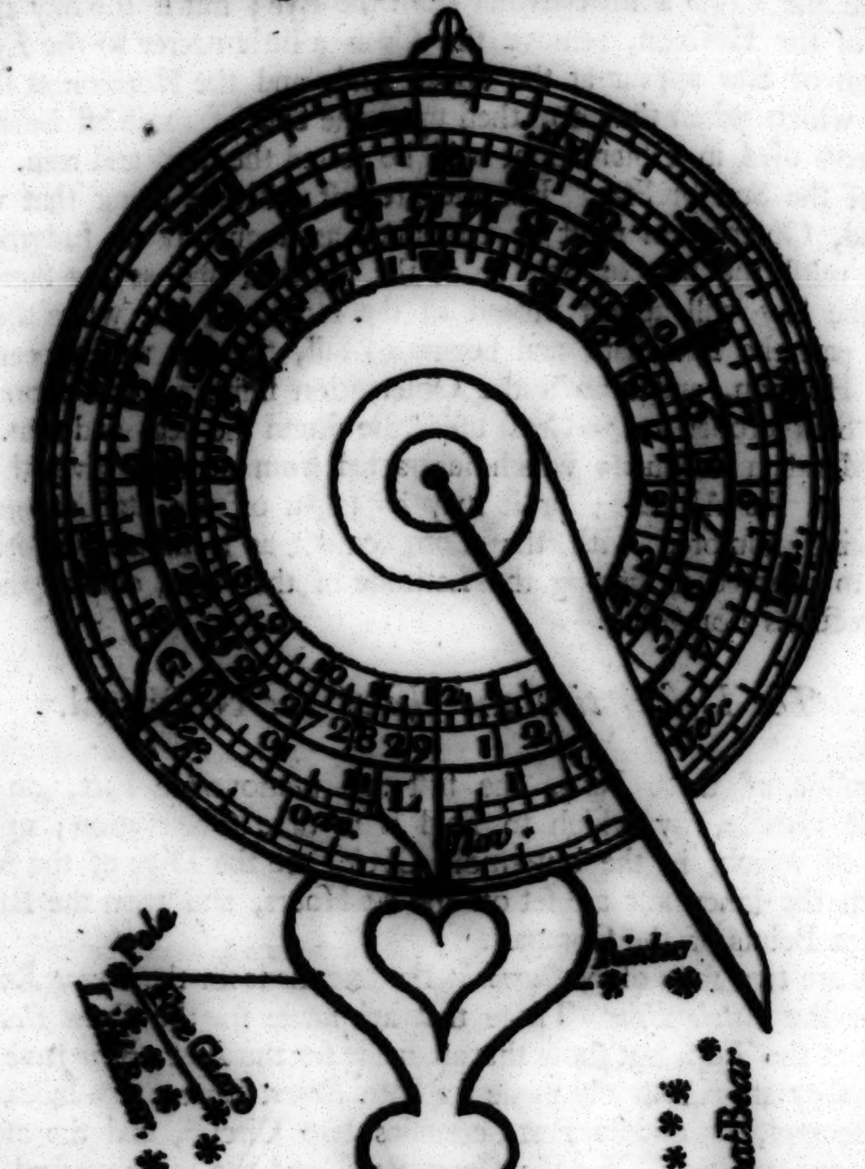
The ſecoud, or middle Part, contains two Circles, and the aforeſaid Indexes, one marked *G*, for the *Great Bear*, and the other marked *L*, for the

the *Little Bear*. The outermoſt Circle is divided into 29 Days and a half, being the Moon's Age; the innermoſt into 24 Hours: The Index belonging to the *Bear* you intend to obſerve by, is to ſet to the Day of the Month at pleaſure.

The third and uppermoſt Part is a long Index; the Edge of which (that reſpects the Center) muſt be turned to the Guards or Pointers, in Time of Obſervation.

To find the Hour of the Night, and upon what Point of the Compaſs the Guards are.

The Figure of the Nocturnal.



To do this, Firſt, ſet the Index of the middle Part to the Day of the Month, then hold the Inſtrument upright, which may be diſcerned by the Tip on the Top of the *Nocturnal*, then look through the Hole in the Middle of the *Nocturnal* for the *North Star*; which having found, turn the Edge of the long Index to the Guards or Pointers, according as you obſerve by the *Little* or *Great Bear*, then ſhall the Edge of the Index (upon the innermoſt Circle of the middle Part) give the Hour of the Night.

Alſo in *Nocturnals* made for both Bears, you have on the Backſide two Circles mark'd at the Bottom, rhe outermoſt with L, and the innermoſt with G; and numbred round with Degrees and Minutes, for finding how much the *Pole Star* is above or below the true Pole; to find which, having fitted the *Nocturnal*, as before directed, obſerve what Figures on the Backſide fall under the Edge of the long Index, in the Circle belonging to the Bear, by which you obſerve, and that is the Deg. and Min. that the Star is above or under the Pole, as is diſtinguiſh'd by the Words *Abo.* and *Und.*

Example. I obſerve by the *Great Bear*, *Sept.* 6. I ſet the Index marked G to *Sept.* 6, and looking through the Hole to the Pole, I turn the long Index till it lie juſt over the two Pointers, as you ſee in the Figure of the *Nocturnal*, and find on the innermoſt Circle of the middle Part of the *Nocturnal*, that it is Two a Clock in the Morning; and on the Back-ſide in the Circle marked G, I find the Pole Star is 2 deg. 26 min. above the Pole, &c. 'tis found alſo by the following Table.

To find the Moon's Southing, and Time of Full Sea by the Nocturnal.

TO do this, it is but looking upon the middle Piece of the *Nocturnal*, and in the outermoſt Circle find the Moon's Age; and oppoſite to it in the innermoſt Circle of the ſame Piece ſtands the Southing.

Ex. Suppoſe the Moon 25 Days old and the Time of her Southing requir'd.

Look for 25 the Moon's Age in the outermoſt Circle, oppoſite to which in the innermoſt Circle ſtands 8, which is the Moon's Southing at 25 Days old required.

Note, That always between the Change and the Full, the Moon comes to South in the Afternoon, but after the Full in the Morning.

Thus having found the Moon's Southing, add thereto the Time of Flowing upon the Full and Change-Days at any Place, and that gives the Time of full Sea when required. But this has been ſufficiently ſhewed in another Place, and therefore needs no Example.

The Uſe of the following Table of the Declination of the North Star.

THE Uſe of the Table is this: Having taken the Alt. of the *Pole Star*, then obſerve with the *Nocturnal* upon what Point of the Compaſs the Guards are; oppoſite to which in this Table ſtands the Declination (ſo called) which if the Star be below the Pole, is to be added to the Alt. but if the Star be above the Pole, to be ſubtracted therefrom, to find the Latitude of the Place.

But the more exact Way to find the Latitude, is by thoſe other Directions for the Stars before given.

A Table of the Declination of the North Star, *upon every Point of the Compaſs the Guards are upon, for both Sorts of* Nocturnals.

	Points of the Compaſs.	For the Guard of the Little Bear.				For the Guards of the Great Bear, called the two Pointers.		
		D.	M.			D.	M.	
If the former of the Guards be aſcending from the North or lower Part of the Meridian.	North	2	09	Above the Pole.	If the after Wheel, or two Pointers be aſcending from the North, or lower Part of the Merid.	2	20	Above the Pole.
	N. by E.	1	52			2	30	
	NNE.	1	29			2	35	
	NE. by N.	1	02			2	33	
	North Eaſt	0	35			2	26	
	NE. by E.	0	06			2	13	
	ENE.	0	22	The North Star is under the Pole.		1	55	
	Eaſt by North	0	52			1	33	
	Eaſt	1	18			1	07	
	Eaſt by South	1	41			0	38	
	ESE.	2	01			0	08	
	SE by E.	2	16			0	22	The North Star under the Pole.
	South Eaſt	2	25			0	52	
	SE by S.	2	30			1	20	
	SSE.	2	29			1	44	
	South by Eaſt	2	22			2	04	
If the former of the Guards be deſcending from the South or upper Part of the Merid.	South	2	11		If the two Pointers be deſcending from the South or upper Part of the Merid.	2	20	
	South by Weſt	1	55			2	30	
	SSW.	1	34			2	29	
	SW by S.	1	10			2	27	
	South Weſt	0	43			2	23	
	SW by W.	0	14			2	13	
	WSW.	0	15	Above the Pole.		1	55	
	Weſt by South	0	44			1	33	
	Weſt	1	11			1	07	
	Weſt by North	1	36			0	38	
	WNW.	1	58			0	08	
	NW by W.	2	14			0	22	Ab. the Pole.
	North Weſt	2	25			0	52	
	NW by N.	2	30			1	20	
	NNW.	2	29			1	44	
	North by Weſt	2	22			2	04	

A Table of the Latitude and Longitude of the principal Harbours, Headlands, and Iſlands in the World; Corrected by the lateſt and beſt Obſervations; accounting the Longitude from the Meridian of the LIZARD.

Note, *When the Latitude and Longitude of an Iſland is given, the middle of the Iſland is meant, except ſome particular Part of it be expreſſed.*

Places Names.	Latitude North.			Longit. E. or W.	
The Coaſt of England.	D.	M.		D.	M
Berwick	55	50		03	35 E
Newcaſtle	54	58		03	44 E
Stockton	54	33		03	49 E
Spurn	53	35		05	44 E
Yarmouth	52	45		06	54 E
LONDON	51	32		05	14 E
North Foreland	5	28		06	24 E
Beachy	50	48		05	39 E
Dunnoſe Iſle Wight	50	38		03	51 E
Portland	50	30		02	26 E
Start Point	50	06		02	29 E
LIZARD	49	57	North Latitude	00	00
Land's end	50	c6		00	46 W
St. Mary Scilly	49	5-		01	31 W
Hartland Point	51	06		00	39 E
Lundy Iſle	51	20		00	34 E
Briſtol	51	32		02	39 E
St. David's Head	51	55		00	08 W
Barſey Iſle	52	46		00	16 E
Holy head	53	23		00	34 E
Liverpool	53	20		02	16 E
Whitehaven	54	25		01	59 E
Carliſle	54	45		02	49 E
The Coaſt of Scotland.					
Glaſcow	55	53 N		01	09 E
N. Part of Sky Iſl:	57	50 N		00	07 W

Places Names.	Latitude N. or S.			Longit. E. or W		
	D.	M.		D.	M.	
North Part of Lewis Iſland	58	20		02	01 W	
St. Kilday	58	02		04	51 W	
Farra Head	58	23		00	09	
Northern Iſles of Orkney	59	13	North Latitude	01	44	East Longitude
Shetland S. Point	59	52		03	44	
Butchaneſs	57	55		00	54	
Aberdeen	57	24		03	37	
Dundee	56	30		02	38	
Edenburgh	55	57		02	28	
The Coaſt of Ireland.						
Dublin	53	20		01	52	
Wexford	52	13		02	02	
Waterford	52	07		02	38	
Cork	51	49		04	16	
Cape Clear	51	10	North Latitude	05	16	West Longitude
Limrick	52	22		04	34	
Galway	53	10		04	49	
Sline Head	53	20		06	01	
Londonderry	54	55		02	46	
Bellfaſt	54	36		01	36	
The Coaſt of Holland and Flanders.						
Scaw	57	26 N		15	24 E	
Helighland	54	28 N		13	49 E	

Ham-

St Agnes head 51 45 Lat [illegible] Long [illegible]
[illegible] head of kingsail Lat 51 [illegible]

Places Names.	Latitude N. or S. D.	M.	Longit. E. or W. D.	M.
Hambrough	53	41	15	38
Emden	53	05	13	14
The Fly	53	18	10	49
The Texel	53	10	10	13
Amſterdam	52	21	10	05
Rotterdam	51	55	09	35
The Brill	51	56	09	24
Sluyce	51	19	09	04
Callice	50	57	07	14
The Coaſt of France and Portugal.				
Diep	49	56	04	08
Cape de Hague	49	46	03	08
Caskets	49	50	02	42
Guernſey	49	36	02	34
Morlaix	48	37	01	24
Uſhant	48	30	00	09
Breſt	48	23	00	50
Penmark	47	48	00	59
Bell Iſle	47	20	02	04
Nants	47	14	03	25
Iſland Dieu	46	40	02	59
Iſland Ree	46	13	03	44
Rochel	46	10	04	00
Bourdeaux	44	50	04	50
Bilboa	43	30	02	14
Cape Ortegal	44	02	02	26W
Cape Finiſter	43	06	04	46W
Porta Port	41	18	04	06W
Burlings	39	39	05	01W
Rock of Lisbon	38	54	05	06W
Cape St. Vincent	37	00	04	18W
Cadiz,	36	16	01	46W
Cape Trefalgar	36	10	01	16W
The Coaſt on the Main Continent within the Straits,				
Gibraltar	36	11N	00	29W
Cape de Gat	37	03N	03	12 E

North Latitude. East Longitude.

Places Names.	Latitude N. or S. D.	M.	Longit. E. or W. D.	M.
Cape Paul	37	58	04	52
Cape Martin	39	00	05	42
Barcelona	41	30	07	35
Marſeilles	43	20	10	29
Toulon	43	06	10	54
Genoa	44	25	13	54
Leghorn	43	18	15	43
Rome	41	51	17	42
Naples	41	05	19	42
Cape Spartavento	38	00	25	12
Cape Collone	39	10	23	14
Gallipoli	40	08	23	53
Cape St. Mary	39	56	24	14
Ancona	43	31	19	58
Venice	45	18	18	24
Lepanto	38	20	27	09
Cape Matapan	36	35	27	34
Cape St. Angelo	36	41	28	34
Athens	38	00	29	43
Cape Martelo S. P. of Negropont	38	00	30	59
Cape Monte Sancto	40	05	31	19
Gallipoli	40	30	33	12
Conſtantinople	41	07	35	14
Smyrna	38	30	32	41
Epheſus	37	54	32	29
Antiocheta	36	40	36	51
Scandaroon	36	00	41	12
Tripoli	34	40	40	54
Alexandria	31	07	36	04
Cape Rufato	33	15	27	09
Cape Miſerato	32	43	21	37
Tripoly	32	55	18	14
Cape Bona	37	05	15	14
Bona	37	00	12	14
Algier	36	40	08	19
Cape de tres forcas	35	34	03	49

North Latitude

Tetu

Places Names.	Latitude North.		Longit E. or W.	
	D.	M.	D.	M.
Tetuan	35	28N	00	38W
Seuta	35	55N	00	33W
Tangier	35	55N	01	00W
Iſlands within the Straits.	North Latitude		Eaſt Longitude	
Alboran	36	10	02	44
Formentaria	38	44	07	04
Yvica	39	05	08	04
Minorca City	39	48	07	54
Port Maon Minorca	39	42	09	46
Gallita	37	40	13	48
Sardinia South End	39	12	13	48
Corſica North End	42	57	14	59
Gorgona	43	34	14	52
Capria	43	06	14	54
[illegible]	42	44	15	19
Meſſina	38	22	11	39
Marittimo	38	12	17	09
Cape Paſſero	36	48	21	18
Malta	36	15	19	49
Corfu	39	45	25	56
Chefalonia	38	15	27	03
Zant	37	47	26	24
Modon or Morea	36	52	26	46
Lemnos	39	50	30	41
Scio	38	20	29	09
C. St, John Weſt end of Candy	35	20	28	41
Cape Solomon, E. end of Candy	35	25	31	45
Rhodes City	36	40	33	14
Weſt end of Cyprus	35	21	36	49
Eaſt-end of Cyprus	35	35	39	39
The Coaſt of Barbary and Guinea.	North Latitude.		Weſt Longitude.	
Cape Spartel	35	46	00	41
Sallee	33	43	01	16
Cape Cantin	32	16	04	06
Cape de Geer	30	04	04	56
Cape Bajador	26	12	09	16
Cape Olerado	23	41	10	36
Cape Blanco	20	35	11	41
Senegall	15	16	10	26

Places Names.	Latitude N. or S		Longit E. or W	
	D.	M.	D.	M.
	North Latitude			
Cape de Verde	19	30	11	12W
River Gambia	13	16	10	06W
Serralion	08	36	07	01W
Monſerado	06	05	04	06W
Cape Palmos	04	03	00	22W
			Eaſt Longitude	
Jaque Jaque	04	16	02	44
Aſſene	04	15	04	14
Cape 3 Points	04	13	05	59
River Volta	05	40	08	44
River Formoſa	07	00	12	54
Cape Formoſa	04	40	13	14
New Callabar	04	12	15	39
Old Callabar	03	18	16	46
River Camerones	04	02	18	24
River de Angra	00	49	18	29
	South Latitude			
Lopas	01	05	17	34
River Congo	05	45	20	39
Angola	08	51	21	10
Cape Negro	16	08	22	00
Cape St. Thomas	23	10	19	37
Secos	28	56	20	46
C. Bona Eſperance	34	25	22	39
Weſtern Iſlands.	North Latitude.		Weſt Longitude	
Corvo	40	05	24	41
Flores	39	40	24	36
Fyal	38	53	22	02
Pico	38	32	21	17
St. George	38	56	20	56
Tercera	38	53	19	28
St. Michael	38	00	17	18
St. Maries	37	00	17	03
The Canary Iſlands.	North Latitude.		Weſt Longitude.	
Ferro	28	00	12	58
Palma	28	50	12	46
Gomero	28	00	12	12
Teneriff	28	20	11	31
Madeira Weſt end	32	17	12	08
Porto Sancto	32	50	10	36
Canaria	27	56	10	22
Fortaventura	27	54	08	10
Lancerota	28	32	07	40

Places Names.	Latitude N. or S.		Longit. E. or W.	
Cape de Verde Iſlands.	D.	M.	D.	M.
		North Latitude.		Weſt Longitude.
St. Antonio	17	10	20	34
St Vincent	16	55	20	24
St. Lucia	16	45	20	16
St. Nicholas	16	40	19	36
Brava	14	35	19	52
Fuego	14	42	19	14
Jago	15	20	18	24
Iſle of May	15	16	17	26
Iſle Sal	16	45	17	16
Bonaviſta	16	05	17	09
Southern Iſlands.				
St. Matthews	01	40 S	02	19 W
Aſcenſion	08	10 S	07	21 W
St. Helena	16	06 S	00	26 W
Fernandepo	02	35 N	17	09 E
Princeps	01	25 N	16	14 E
St. Thomas	00	00	15	12 E
Annabona	01	42 S	14	02 E
The Coaſt on the Main Continent in the Eaſt-Indies.				
		North Latitude.		Eaſt Longitude.
Cape Lagulias	35	35 S	23	54
Cape Corientes	23	52 S	40	49
Meſambique	15	05 S	45	44
River de Fugos	00	00	46	29
Cape Baſſos	04	00	55	04
Cape Guardafoy	11	50	57	44
Cape Roſulgat	22	27	65	59
Cape Muca	26	56	62	24
Baſſera	30	00	54	19
Surrat	21	08	78	39
Goa	15	22	79	51
Calecute	11	17	80	08
Cochin	09	58	81	59
Cape Comerine	07	50	83	39
Fort St. George	13	08	86	56

Places Names.	Latitude N. or S.		Longit. E. or W.	
	D.	M.	D.	M.
		North Latitude		Eaſt Longitude
Dew Point	15	50	87	19
Viſegapatam	17	40	90	21
Cape Palmaris	20	45	93	24
Bengal	22	27	97	03
Cape Negrais	26	23	98	19
Cape Malacca	20	25	108	34
Siam Entrance	13	10	106	15
Cambodia Entrance	10	30	110	34
Cochin	18	25	109	12
Cantam	23	30	118	34
Amoy or Quemoy	24	35	122	09
Lampo	30	10	125	39
Nanquin	32	52	125	19
Iſlands in the Eaſt-Indies.				
		South Latitude		Eaſt Longitude.
Madagaſcar } Send	26	06	51	34
St. Laurence } Neud	12	10	55	24
Mayetta	13	10	50	59
Mohilla	12	15	48	55
Comero	11	50	48	59
St. Juan de Nova	17	30	47	49
Mauritius	20	05	60	19
Digo Royes	19	45	66	49
Romeras de Caſtela-	29	05	72	10
Amſterdam [mos	39	50	79	38
St. Brandon	16	38	69	44
Digo Gratioſa	08	42	74	19
Quabella	03	49	57	53
Baſſos de Chagos	05	05	75	39
Yas de Digo Rays	00	00	77	19
		N. Latitude		
Maldivia } N. end	07	05	78	19
Maldivia } S. end	01	00	81	29
Malique	09	00	78	29
Sacatra	12	28	60	51
Abdeleur	12	10	59	37
Cape Gallo de Zelone	06	07	85	50

Yas

Places Names.	Latitude N. or S. D.	M.		Longit. E. or W. D.	M.	
Yas de Amber	00	00	N. Latitude	57	44	
Andaman	13	00		96	39	
Nicobor	07	05		98	09	
Sumatra NW. End	05	28		98	59	
Verkins Iſland	02	22		96	21	
Naſſau Iſland	02	44	South Latitude.	103	46	
Bencola	03	50		106	27	
Sumatra SE. End	05	42		109	18	
Engano	05	40		106	07	
Selam	08	20		107	27	
Princes Iſland	06	30		109	16	
Bantam in Java	05	47		110	25	
Batavia	05	37		117	41	Eaſt Longitude.
Java Eaſt End	08	35		109	32	
Straits of Sundy	05	52		111	51	
Banca South End	03	25		118	06	
Borneo South Point	04	14		131	51	
Bandy Iſles	05	05		131	58	
Celebes South end	06	00		122	41	
Celebes Northend	01	40	North Latitude.	126	44	
Mindano Weſt point	06	30		123	49	
Borneo North point	07	10		117	59	
Luconio S. point	12	30		126	04	
Luconio NE. poi.	18	35		124	19	
Anain W. point	19	30		113	20	
Anain E. point	19	55		116	30	
Formoſa S. point	22	00		124	44	
Formoſa N. point	25	32		125	39	
Piſcadore Iſles	23	30		122	49	
Iſlands Chuſan	30	38		125	49	
Japan SE. point	39	50		140	29	
Japan SW. point	39	10		132	00	

The Coaſt of America in the South Sea, from Callifornia to Cape Horn.

Places Names.	Latitude D.	M.		Longit. D.	M.	
Cape St. Sebaſtian	42	30	North Latitude.	124	41	Weſt Longitude.
Cape St. Lucia	23	25		106	42	
Cape Corientes	17	40		105	16	
Aquapulco	17	00		101	14	
Aquatulco	15	27		95	49	
Guatimala	14	25		99	46	
Panama	08	56		77	04	

Places Names.	Latitude N. or S. D.	M.		Longit. E. or W. D.	M.	
Bay Bonaventuro	03	28N		74	52	
Iſland of Gallopega	00	00		84	56	
Cape del Ajuga	06	38	South Latitude.	83	36	Weſt Longitude.
Lima	12	30		68	16	
Arica	18	12		[illegible]	58	
La Serena	24	40		71	18	
I. Juan Fernando	33	20		81	34	
Baldivia	32	35		76	16	
Port Steven	46	50		77	22	
Cape Victory	52	15		78	06	
Cape Horn	57	58		74	41	

The Coaſt of Brazile in South America, from Cape Horn to Cape Roque.

Places Names.	Latitude D.	M.		Longit. D.	M.	
Magellan E. entran.	51	58		70	26	
River Julian	48	40		69	18	
Cape Blanco near R. Camarones.	46	50		66	51	
Buenos Aires R. Plata	36	10		52	16	
River Grand	31	55	South Latitude.	46	25	Weſt Longitude.
St. Katherines	28	00		42	36	
Cape Frio	23	10		37	42	
Spirito Sancto	19	58		36	46	
P. Segura	16	22		35	44	
Bay Todus Sanctus	13	00		35	21	
R. St. Franiſco	10	55		32	32	
Cape St. Auguſtine	08	05		30	24	
Cape Roque	05	00		30	38	
Triſtian de Cunha	37	05		10	24	
Trinidada	20	30		24	46	

The Coaſt of the Main Continent in the Weſt-Indies.

Places Names.	Latitude D.	M.		Longit. D.	M.	
R. Amazones Entr.	00	00		45	40	
North Cape	02	05	North Latitude.	44	41	Weſt Longitude
Suranam	06	00		51	41	
Oronoque	08	15		53	51	
G. Coquibaca	12	50		65	26	
Carthagena	10	50		70	36	
Scots Settlement	08	30		73	31	
Nicarague Entrance	11	15		79	51	
Cape Catocha	21	12		83	41	

Places Names.	Latitude North D.	M.	Longit. E. or W. D.	M.
Campeche	19	20 N	87	51 W
La Vera Cruz	19	15 N	95	11 W
[illegible]	30	26 N	84	16 W
Cape Florida	24	48 N	76	41 W
The Caribbee Iſlands.				
Trinidada	10	05	54	51
Tobago	11	10	54	06
Granado	12	07	55	16
Barbadoes	13	10	52	49
St. Vincent	13	12	54	08
St. Lucia	13	52	54	03
Martinico	14	48	53	11
Dominico	15	35	53	13
Marigallante	15	53	53	06
Guadalupe	16	15	54	09
Montſerat	16	40	54	21
Antegoa	17	00	54	07
Nevis	17	06	55	04
St. Chriſtophers	17	22	55	21
Barbuda	17	43	54	11
St. Bartholomew	17	54	55	31
St. Martins	18	05	55	25
Anguilla	18	13	55	41
Virgins	18	23	57	08
St. Cruz	17	38	57	21
[illegible]	18	00	58	01
Porto Rico St. Johns	18	33	59	06
[illegible] Hiſpan.	18	15	63	36
[illegible] Jamaica	18	00	71	49
[illegible] of Cuba	20	20	68	51
[illegible]	22	50	78	16
[illegible] Hondy	22	35	79	26
Cape St. Antonio	21	50	81	18
Bahama Iſlands.				
Bermudas	32	30 N	36	26 W
N. Point of Bahama Bank	28	22 N	73	01 W

North Latitude. West Longitude.

Places Names.	Latitude North D.	M.	Longit. Weſt D.	M.
Bahama Iſland	27	05	73	44
Abacco S. Point	25	50	72	06
Harbour Iſland	25	40	71	21
Androſs N. Point	25	15	73	46
Providence	27	00	72	31
Illathera S. point	24	30	70	48
Cat Iſland	24	25	70	06
Watling Iſland	24	07	69	36
Rum Key	23	45	69	51
Exuma	23	25	70	43
Crooked Iſle N. point	23	03	68	46
Atkins Key	22	30	69	01
Meraparvouz	21	57	69	26
Atwood Keys	23	09	68	16
French Keys	22	40	68	21
Mayaguana	22	35	67	46
Hogſties	21	15	68	36
Hyneago	20	57	68	06
Cankcoſs Bank N. point	20	50	66	01
Turks Iſland	21	35	64	54
Abrollo N. point	21	40	63	26
Platewrack	20	03	62	56

North Latitude. Weſt Longitude.

The Coaſt of Carolina, Virginia, Maryland, Penſylvania, New-England, and New-foundland.

Places Names.	Latitude North D.	M.	Longit. Weſt D.	M.
Charles Town upon Aſhly River	32	41	73	36
Cape Hatteras	35	10	59	11
Cape Henry	37	00	69	16
Cape Charles	37	14	69	01
Cape Hinlopen	39	04	68	11
Long Iſland	40	05	65	26
New York	41	00	66	51

North Latitude. Weſt Longitude.

Cape

Diseada Latd 16:10 North Longd 53 16 W

Places Names.	Latitude North D.	M.	Longit. West D.	M.
Cape Cod	42	10	62	31
Boſton	42	35	63	36
Cape Sable	43	45	58	11
Iſland Sable	44	30	53	51
Cape Britain	46	20	53	06
Quebeck	47	05	64	36
Bay of Breſt	52	10	49	46
Bell Iſland	52	05	48	56
Cape St. John	50	09	47	21
Cape Bonaviſta	49	11	46	49
Trinity Bay	48	27	49	41
Conception Bay	47	53	48	56
St. John's Harbour	47	28	48	41
Bay of Bulls	47	40	49	32
Cape Race	46	30	48	11
Cape St. Mary	47	10	48	06
Placentia	47	57	49	46
Cape Roy	48	21	52	01

North Latitude. Weſt Longitude.

The Coaſt of Hudſon's Bay, and the Straits.

Places Names.	Latitude North D.	M.	Longit. West D.	M.
Buttons Iſles	60	05	64	36
Cape Charles	62	35	70	06
Cape Walſingham	63	05	72	26
Manſfield Iſle	62	20	70	16
Cape Jones	55	03	73	01
Ruperts River	51	16	73	41
Albany River	52	32	77	51
The Cubbs	54	18	77	36
C. Henrietta Maria	55	06	77	48
Port Nelſon	57	05	87	36
Cape Churchil	59	00	87	43
C. Southampton	61	57	83	16
Shark Point	64	27	78	06
Nottingham Iſle	63	38	74	32
Q. Ann's Foreland	63	32	69	37
Reſolution Iſle	61	55	59	36
Cape Farewell	59	10	41	31

North Latitude. Weſt Longitude.

The Coaſt of Iceland, Greenland, Nova Zembla, and the Northern Iſles.

Places Names.	Latitude N. or S. D.	M.	Longit. E. or W. D.	M.
Sound Royal	66	22	19	29
Bargazer Point	66	30	16	26
Whales Back	65	27	15	19
Merchants Foreland	63	20	19	19
Halliford	64	30	29	29
Fair Foreland	65	10	31	59
Grims Iſland	66	51	22	59
Weſtmania Iſles	63	51	23	24
Iſles of Fero	62	06	00	14
Beerenberg, or John Mains Iſle	71	45	09	44
Point Lookout	76	40	21	39
Horn Sound	77	23	19	34
Fair Foreland	79	18	16	04
Hacluits Headland	79	55	17	14
Helies Sound	79	15	17	19
Lees Foreland	78	05	28	39
Whales Head	77	18	26	44
Hope Iſland	76	22	27	14
Cherry or Bear Iſle	74	35	23	19
Admiralty Iſland	75	05	65	04
Fretum Borough	69	55	67	19
Cape Candenoſe	69	17	47	44
Catnoſe	65	43	40	28
Archangel Bar	65	05	40	44
Croſs Iſland	66	31	41	47
Sweetnoſe	68	08	39	56
Kilduyn	69	32	35	29
North Cape	71	25	27	14
Surrey	71	05	21	54
Tromſound	70	18	21	14
Loefort SW. Point	67	47	14	49
Drouton	64	00	15	54
Stadland	62	10	09	52
North-bergen	60	16	10	54
Naze of Norway	57	50	12	36

Weſt Longit. North Latitude. Eaſt Longitude.

Places Names.	Latitude North.		Longit. Eaſt.		Places Names.	Latitude North.		Longit. Eaſt.	
Sea-Coaſt in the Sound, and Baltick Sea.	D.	M.	D.	M.		D.	M.	D.	M.
Mardau	58	25	14	19	Revel	59	00	29	59
Larwick	58	54	14	34	Riga	56	50	30	04
Chriſtians	59	10	14	59	Derwinda	57	20	27	14
Maeſterland	57	58	16	59	Coningsberg	55	00	25	44
Gottenberg	57	33	17	39	Dantzick	54	22	24	14
Elſinor	56	00	17	46	Wisby in Gotland	57	37	24	04
Copenhagen	55	44	17	49	Bornholm	55	27	20	07
Valſterborn	55	20	18	09	Straelſound	54	45	18	34
Kalmer	56	40	21	54	Lubeck	54	25	16	19
Stockholm	59	20	23	39	Anout	56	42	16	12
Wyborg	60	20	34	40	Leſou	57	05	15	54
Petersburg	59	25	35	04	Scaw	57	26	15	24
Narve	58	39	33	28					

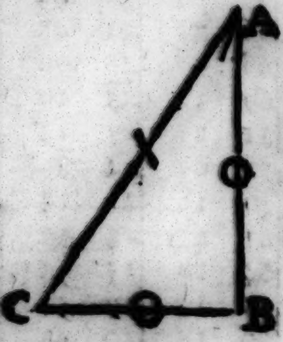
North Latitude. Eaſt Longitude. North Latitude. Eaſt Longitude.

Problems of Plain Sailing, wrought by the Logarithms, *and by* Gunter's Scale.

PROBLEM I.

THE Courſe and Diſtance being given; to find the Difference of Latitude and Departure.

Example. Suppoſe a Ship fails South Weſt by South, 382 Minutes, and it be required to find the Difference of Latitude and Departure.



In the Triangle ABC.
AC repreſents the Diſtance ſailed.
AB the Difference of Latitude.
BC the Departure.
BAC (or the Angle at A) the Angle of the Courſe.
ACB (or the Angle at C) the Complement of the Courſe to 90°.

Characters uſed in Navigation *and* Aſtronomy.

S. ſtands for Sine.
T. for Tangent.
Sc. Sine Complement. Tc. Tangent Complement.
The given Sides and Angles of a Triangle are mark'd with a Daſh thus (').
The required Sides and Angles with a Cypher thus (°).

The Operation by the Logarithms. *For the Difference of Latitude.*

As Radius ——————————— 10.000000
To the Diſtance ſailed 382 Minutes ——————— 2.582063
So is Sc. of the Courſe 56° 15′ ——————— 9.919846
To the Difference of Latitude 317 Minutes $\frac{6}{10}$ ———— 12.501909

For the Departure.

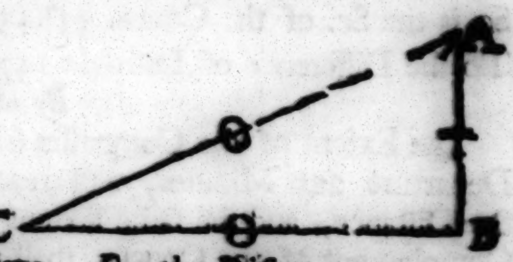
As Radius ——————————— 10.000000
To the Diſtance ſailed 382 Minutes ——————— 2.582063
So is the S. of the Courſe 33° 45′ ——————— 9.744739
To the Departure, 212 Minutes $\frac{2}{10}$ ——————— 12.326802

The Operation by Gunter's Scale.

One Foot of the Compaſſes being in the Radius, or S. of 8 Points; extend the other to the Diſtance 382 Minutes, the ſaid Extent laid from S. Courſe 3 Points will reach to 212 Minutes the Departure from the Meridian, and the Compaſſes kept at the ſame Diſtance will reach from the Sc. Courſe 5 Points to 317 Minutes, the Difference of Latitude as above.

PROB. II. The Courſe and Difference of Latitude given, to find the Diſtance and Departure.

Suppoſe a Ship ſails W. S. W. until the Difference of Latitude be 219 Leagues, and the Diſtance and Departure required.



The Operation by the Logarithms. *For the Diſtance.*

As Sc. of the Courſe 22° 30′ ——————— 9.582840
To the Difference of Latitude 219 Leagues ——————— 2.340444
So is Radius ——————————— 10.000000
To the Diſtance, which is 572 $\frac{2}{10}$ Leagues ——————— 2.757604

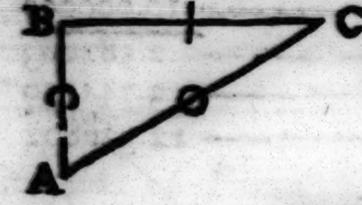
For the Departure.

As Radius ——————————— 10.000000
To the Diſtance $572\frac{3}{10}$ Leagues found before ——— 2.757604
So is the Sine of the Courſe 67° 30′ ——————— 9.965615
To the Departure $528\frac{7}{10}$ Leagues ——————— $\cancel{1}2.723219$

By the Gunter.

The Compaſſes being extended from the S. of 2 Points, the Complement of the Courſe to 219 Leagues, the Difference of Latitude, will reach from Radius S. 8 Points, to 572 Leagues the Diſtance, and the ſame Extent of the Compaſſes from the Sine of the Courſe 6 Points, ſhall reach to 529 Leagues, the Departure.

PROB. III. The Courſe and Departure given, to find the Diſtance and Difference of Latitude.



Suppoſe a Ship ſails North Eaſt by Eaſt, until her Departure be 220 Minutes, the Diſtance and Difference of Latitude required.

By the Logarithms. For the Diſtance.

As the S. of the Courſe 56° 15′ ——————— 9.919846
To the Departure 220 Minutes ——————— 2.342423
So is the Radius ——————————— 10.000000
To the Diſtance 265 Minutes ——————— $\cancel{1}2.422577$

For the Difference of Latitude.

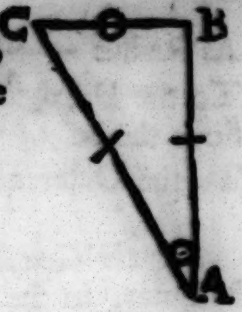
As Radius ——————————— 10.000000
To the Diſtance 265 Minutes ——————— 2.423246
So is the Sc. of the Courſe 33° 45′ ——————— 9.744739
To the Difference of Latitude 147 Minutes ——— $\cancel{1}2.167985$

By the Gunter.

The Extent of the Compaſſes from the S. of the Courſe 5 Points, to the Departure 220 Minutes, will reach from Radius S. of 8 Points, to 265 the Diſtance, and the ſame Extent of the Compaſſes from S. 3 Points the Complement of the Courſe, ſhall reach to the Difference of Latitude 147 Minutes as above.

PROB. IV. The Diſtance and Difference of Latitude given, to find the Courſe and Departure.

Sup-



Suppoſe a Ship ſails between the North and the Weſt 206 Miles, until the Difference of Latitude be 197 Miles, the Courſe and Departure required.

By the Logarithms. *For the Courſe.*

As the Diſtance 206 Miles	2.313867
To the Radius	10.000000
So is the Difference of Latitude, 197 Miles	2.294466
To the Sc. of the Courſe; which is N. 17° 00′ W.	9.980599

For the Departure.

As Radius	10.000000
To the Diſtance 206 Miles	2.313867
So is the S. of the Courſe 17° 00′	9.465935
To the Departure 60 Miles	11.779802

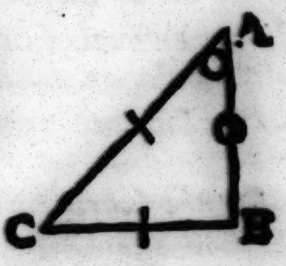
By the Gunter.

For the Courſe. The Extent from the Diſtance 206 Miles, to the Difference of Latitude 197 Miles, ſhall reach from Radius S. 90 deg. to the Sine of 73 deg. 00 min. the Complement of the Courſe, which ſubtracted from 90d. is 17d. 00m. the Courſe N. Weſterly, or N. by W. half W.

For the Departure. The Extent from Radius S. 90 deg. to the Sine of the Courſe 17 deg. 00 min. ſhall reach from the Diſtance 206 Minutes to the Departure 60 Minutes as above.

PROB. V. The Diſtance and Departure given, to find the Courſe and Difference of Latitude.

Suppoſe a Ship ſails between the South and the Weſt 247 Minutes, until the Departure be 197 Minutes, and it be required to find the Courſe and Difference of Latitude.



The Operation by the Logarithms. *For the Courſe.*

As the Diſtance 247 Minutes	2.392697
To Radius	10.000000
So is the Departure 197 Minutes	2.294466
To the Sine of the Courſe 52 deg. 54 min. Weſterly	9.901769

For

For the Difference of Latitude.

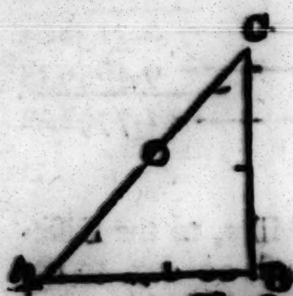
As Radius ——————————— 10.000000
To the Diſtance 247 Minutes ——————— 2.392697
So is the Sc. of the Courſe 37 deg. 06 min. ——— 9.780467
To the Difference of Latitude 149 min. ——— 12.173164

By the Gunter.

For the Courſe. The Extent of the Compaſſes from the Diſtance 247 Minutes, to the Departure 197 Minutes, ſhall reach the ſame way from Radius S. 90 deg. to the Sine of the Courſe, 52 deg. 54 min. South Weſterly, or South Weſt ¾ Weſt.

For the Difference of Latitude. The Extent from Radius S. 90 deg. to the S. 37 deg. 06 min. the Complement of the Courſe, will reach the ſame way from the Diſtance 247 min. to the Difference of Latitude, 149 min.

PROB. VI. The Difference of Latitude and Departure given, to find the Courſe and Diſtance.



Suppoſe a Ship ſails between the South and Weſt until the Difference of Latitude be 154 Leagues, her Departure 200 Leagues, and it be required to find the Courſe and Diſtance.

The Operation by the Logarithms. *For the Courſe.*

As the Difference of Latitude 154 Leagues ——— 2.187521
To Radius ——————————— 10.000000
So is the Departure 200 Leagues ——————— 2.301030
To the Tang. of the Courſe 52 deg. 24 min. South Weſterly 10.113509

For the Diſtance.

As the Sc. of the Courſe 37 deg. 36 min. ——————— 9.785433
To the Difference of Latitude 154 Leagues ——————— 2.187521
So is the Radius ——————————— 10.000000
To the Diſtance 252 Leagues ——————— 2.402088

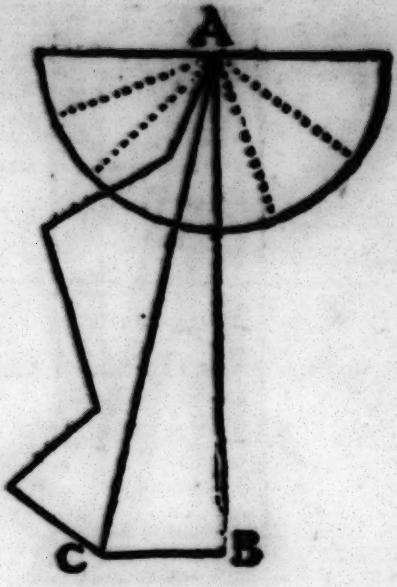
By the Gunter.

For the Courſe. The Extent of the Compaſſes from the Difference of Latitude 154 Leagues, to the Departure 200 Leagues, ſhall reach from Radius or Tangent of 45 deg. to the Tang. of the Courſe, 52 deg. 24 min. South Weſterly, or South Weſt ¾ Weſt.

For the Diſtance. The Extent from the S. 37 deg. 36 min. the Complement of the Courſe, To Radius, or the S. of 90 deg. will reach from the Difference of Latitude 154 Leagues, to the Diſtance 252 Leagues.

PROB. VII.

This Problem ſhews the manner of working a Traverſe, and is very uſeful in keeping a Reckoning by Plain Sailing.



Example.

Suppoſe a Ship bound to a certain Port, and ſhe ſails firſt *S S W.* 40 minutes, then *SW.* 60 min. then *S* by *E.* 63 min. *WSW.* 49 min. then *S. E.* by *S.* 56 min. and the Difference of Latitude and Departure the Ship hath made, with the direct Courſe and Diſtance is required.

The Operations by the Logarithms.

For the Difference of Latitude for the firſt Courſe.

As Radius	10.000000
To the Diſtance 40 min.	1.602060
So is the Sc. of the Courſe 23° 30′	9.965615
To the Difference of Latitude, 36 min. $\frac{9}{10}$	11.567675

For the Departure of the firſt Courſe.

As Radius	10.000000
To the Diſtance 40 min.	1.602060
So is the S. of the Courſe 22° 30′	9.582839
To the Departure 15 min. $\frac{3}{10}$	11.184899

By the Gunter.

The Extent of the Compaſſes from Radius the S. of 8 Points, to the Diſtance 40 min. that Extent in the Compaſſes laid from the Sine of the Courſe 2 Points will reach to 15 min. $\frac{3}{10}$ the Departure, and the Compaſſes being kept to the ſame Extent, and laid from Sine 6 Points, the Complement of the Courſe will reach to 36 min. $\frac{9}{10}$ the Difference of Latitude.

In the ſame manner proceed to find the Difference of Latitude and Departure for each Courſe and Diſtance; which being found, place in a Table as follows.

The Traverſe Table.

Courſe.	*Diſtances*	*North.*	*South.*	*Eaſt.*	*Weſt.*
S S W	40		37.0		15.3
S W	60		42.4		42.4
S by E	63		61.8	12.3	
W S W.	49		18.8		45.3
SE by S.	56		46.6	31.1	
		Diff. Lat.	206.6	43.4	103.0
					43.4
				Dep.	59.6

The Explanation of the Table.

For the placing the Difference of Latitude and Departure in their proper Columns, obſerve, that if the Courſe be Northerly the Difference of Latitude is put in the North Column ; if it be Southerly in the South Colum ; and if the Courſe be Eaſterly, the Departure is put in the Eaſt Column ; if Weſterly in the Weſt Column.

Thus having framed the Table, add up the North, South, Eaſt, and Weſt Columns ſeverally, whereby the Difference of Latitude appears to be 206$\frac{6}{10}$ Minutes South, becauſe there is nothing in the North Column : The Departure 59$\frac{6}{10}$ Minutes Weſt, becauſe ſo much the Weſt Column exceeds the Eaſt : By which Difference of Latitude and Departure, find the direct Courſe and Diſtance as follows.

The Operation by the Logarithms. *For the direct Courſe.*

As the Difference of Latitude 206 min. $\frac{6}{10}$	2.315130
To the Radius	10.000000
So is the Departure 59 min. $\frac{6}{10}$	1.775246
To the T. of the Courſe 16° 5′ South Weſterly, becauſe the South and Weſt Columns exceed the North and Eaſt.	9.460116

For the Diſtance

As the Sc. of the Courſe 16d. 5m.	9.982660
To the Difference of Latitude 206 min. $\frac{6}{10}$	2.315130
So is Radius	10.000000
To the Diſtance required 215 Minutes	2.332470

By the Gunter. *For the direct Courſe.*

The Extent of the Compaſſes from the Difference of Latitude 206min. to the Departure 59 min. ſhall reach from the Tangent of 45d. (or Radius) to the Tangent of 16d. 5m. the Courſe required.

For the Diſtance.

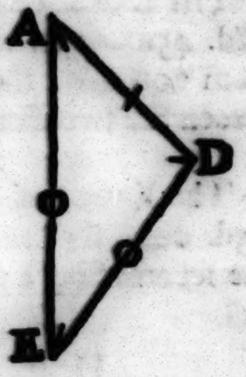
The Extent from S. 73 deg. 55 min. the Complement of the Courſe, to S. 90 deg. *viz.* Radius, ſhall reach from the Difference of Latitude 206 min. to the Diſtance 215 Minutes.

Oblique-angled Plain Triangles, applied in PROBLEMS *of* Plain Sailing, *and wrought by the* Logarithms, *and* Gunter's Scale.

PROB. I. THE Angles and one of the Sides given, to find either of the other Sides.

Example.

Suppoſe there are two Ports both under one Meridian, a Ship ſails from the Northermoſt SE. 206 Miles, another Ship ſails from the Southermoſt North Eaſt by North, a certain Number of Miles, and meets with the firſt Ship; the Diſtance between theſe two Ports, and the Diſtance ſailed by the ſecond Ship is required.



In the Triangle ADE.

A and E repreſents the two Ports, AD the firſt Ship's Diſtance. ED the ſecond Ship's Diſtance. AE the Diſtance between the two Ports.

The Operation by the Logarithms. *For the Diſtance between the two Ports.*

As S. AED 33d. 45m.——————— Co. Ar. 0.255261
To AD the firſt Ship's Diſtance 206 min. ——————— 2.313867
So is S. ADE 105d. 15m. which ſubtract from 180 deg.—— 9.991573
To AE the Diſtance between the two Ports 364 min.———— 12.560701

In all Operations where Radius is not one of the three given Terms, to ſave the Labour of ſubtracting the firſt Logarithm from the Sum of the ſecond and third, uſe the Complement Arithmetical of the firſt Logarithm, which is found by ſubtracting each Figure of the Logarithm from 9, except the firſt towards the Right-hand, which is ſubtracted from 10, as in the Operation, the Logarithm Sine found in the Table is 9.744739, wherefore beginning at the Left-hand ſay, 9 from 9 there remains 0; 7 from 9 there remains 2; 4 from 9, there remains 5; 4 from 9 there remains 5; 7 from 9 there remains 2; 3 from 9 there remains 6; 9 from 10, there remains 1. So the Complement Arithmetical of the firſt Logarithm, is 0.255261, which added to the other two Logarithms, and from the Sum abate Radius, the Remainder is the Logarithm, Sine, or Tangent required.

And *Note*, to find the Sine of any Degree and Minute above 90d. ſubtract the Degree and Minute from 180d. the Sine of the Remainder is the Sine required.

For the ſecond Ship's Diſtance.

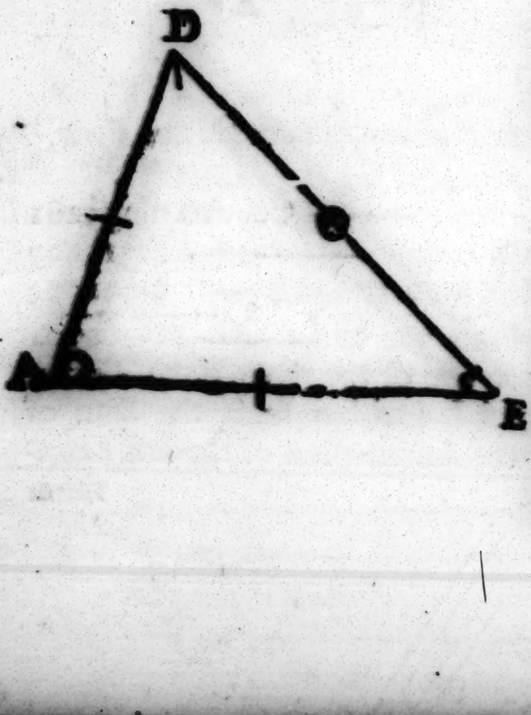
As S. AED 33d. 45m.	Co. Ar. 0.255261
To AD the firſt Ship's Diſtance 206 min.	2.313867
So is S. DAE 45d. 00m.	9.849485
To DE the ſecond Ship's Diſtance, 262 min.	12.418613

By the Gunter. *For the Diſtance between the two Ports.*

The Extent of the Compaſſes from S. of 33d. 45m. to the S. ADE 78d. 45m. (*viz.* the Complement of 101d. 15m. to 180d.) ſhall reach from 206 min. the firſt Ship's Diſtance, to 364 min. the Diſtance between the two Ports as above.

For the ſecond Ship's Diſtance.

The Extent of the Compaſſes from the S. of 33d. 45m. to the S. of 45d. 00m. ſhall reach from 206 min. the firſt Ship's diſtance, to 262 min. the ſecond Ship's diſtance required.



PROB. II.

Two Sides and an Angle oppoſite to one of them being given, to find the other oppoſite Angle and the third Side.

Example.

Suppoſe two Ports, whoſe Bearing is North Eaſt and South Weſt, diſtant 396 Miles, a Ship at the Northermoſt ſails South South Eaſt, and another Ship at the Southermoſt ſails thence 518 Miles, and meets with the firſt Ship: The Courſe ſailed by the ſecond Ship, and the firſt Ship's Diſtance are required. *In*

In the Triangle ADE.

A repreſents the Southermoſt Port, D the Northermoſt.
AD the Diſtance between the two Ports.
DE the Courſe and Diſtance ſailed by the firſt Ship.
AE the Courſe and Diſtance ſailed by the ſecond Ship.

The Operation by the Logarithms. *For the ſecond Ship's Courſe.*

As AE the ſecond Ship's diſtance 518 min.	Co. Ar. 7.285671
To S. ADE 67d. 30m.	9.965615
So is AD the diſtance between the two Ports 396 min.	2.597695
To S. AED 44 deg. 56 min.	19.848981

The Angle at D 67d. 30m. and the Angle at E 44d. 56m. being added together and ſubtracted from 180d. gives 67d. 34m. the Angle at A, which makes neareſt 6 Points, and 6 Points reckon'd from the North Eaſt to the Southwards gives ESE. the ſecond Ship's Courſe required.

For the firſt Ship's Diſtance.

As S. ADE 67 deg. 30 min.	Co. Ar. 0.034385
To AE the ſecond Ship's diſtance 518 min.	2.714329
So is S. DAE 67 deg. 34 min.	9.965824
To DE the firſt Ship's diſtance 518 min.	12.714538

By the Gunter. *For the ſecond Ship's Courſe.*

The Extent of the Compaſſes from 518 min. to S. 67d. 30m. ſhall reach from 396 min. to S. 47d. 56 min. which added to the Angle at D, and the Sum ſubtracted from 180d. gives 67° 30′, the Angle at A, as above.

For the firſt Ship's Diſtance. The Extent from S. 67d. 30m. to 518m. will reach from S. 67d. 34 min. to 518 min. the Ship's diſtance, as above.

PROB. III.

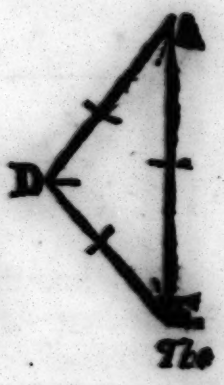
Two Sides and the contained Angle given, to find the other Angle.

Example.

Suppoſe two Ships ſail from one Port; one ſails N E. 140 Miles, the other South Eaſt by Eaſt 115 Miles, the Bearing and Diſtance of theſe two Ships is required.

Let D repreſent the Port, DA the firſt Ship's diſtance, and DE the ſecond.

Miles
140
115
255
Diff. 25



BIBLIOT

The Operation by the Logarithms. *For the Bearing of the two Ships.*

As the Sum of the Sides AD and DE 255min.——— Co. Ar. 7.593459
To the Difference of the ſaid Sides 25 min.——————1.397940
So is the T. of halſ the Sum of their oppoſite Angles 50° 37′—10.085698
To the T. of half their Difference, which is 6d. 48m. ———~~1~~9.077097

The half Difference added to the half Sum, gives 57d. 25m. the greater Angle AED. The half Difference ſubtracted from it, gives 43d. 49m. the leſſer Angle DAE. Whereſore the Bearing of the two ſhips is N. Eaſterly or South Weſterly 1d. 11m. *For the Diſtance of the two Ships.*

As S. AED 57 deg. 25 min. ——————Co. Ar. 0.074373
To AD the firſt Ship's Diſtance 140 min —————— 2.146128
So is S. ADE 78deg. 45min.——————9.991573
To AE the Diſtance of the Ships, 163 min. —————— ~~1~~2.212074

By the Gunter. *For the Bearing of the Ships.*

The Extent of the Compaſſes from the Sum of the Sides 255m. to their Difference 25 min. ſhall reach from the T. of the half Sum of the required Angles 50° 37′ to the T. of half the Difference of the ſaid Angles 6° 48′.

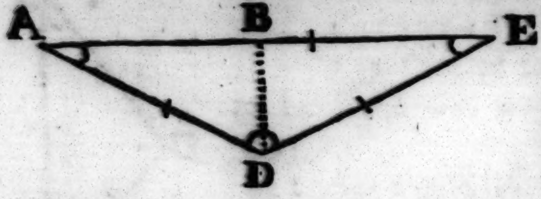
In the foregoing Operation by the *Gunter*, the Practitioner may be at a Loſs, becauſe in extending the Compaſſes from the T. 50° 37′ decreaſing, it will fall beyond the T. of 45 deg. at the End of the Line. To remedy this place, the Extent from 255 to 25, from the T. 45d. and it will reach to T. of 5d. 37m. then letting one Point ſtand at 5d. 37m. extend the other to the T. 50d. 37m. this Extent place from the T. of 45d. ſhall fall on the T. 6d. 48m. required. *For the Diſtance of the Ships.*

The Extent from the Sine of 57d. 25m. to the Sine 78d. 45m. ſhall reach from 140 min. to 163 min.

PROB. IV. Three Sides being given, to find an Angle.

Example. Suppoſe there are two Ports both in one Latitude, diſtant 536 Miles, a Ship ſails from the Eaſtermoſt 306 Miles between the Sonth and the Weſt: Another Ship ſails from the Weſtermoſt 290 Miles, and meets with the firſt Ship. The Courſe that each Ship ſteer'd is requir'd.

Let A and E repreſent the two Ports, D the place weere the Ships meets.



This Queſtion is reſolved by lettiug fall a Perpendicular DB, reducing the Oblique Triangle ADE, into the two Right-angled Triangles ABD and BDE, then the Operation is as follows

Firſt, find the Segment of the Baſe BE, thus.

As the Baſe AE, 536 Miles——————— Co. Ar. 7.270835
To the Sum of the Sides AD and ED 596Miles——————2.775246
So is the Difference of the ſaid Sides 16 Miles —————— 1.204120
To a Segment of the Baſe, which is 18 Miles ——————~~1~~1.250201

The whole Baſe is——————536 min.
The Difference of the Segment is——————18

Sum is——————554

Half Sum——————277 the greater Segment BE.

Then ſay, *For the firſt Ship's Courſe.*

As DE the firſt Ship's diſtance 306 min.——————2.485721
To Radius——————10.000000
So is the greater Segment BE 277 min.——————2.442479

To Sc. BED 25d. 9m.——————9.956758

The Angle at E is the Courſe from the Weſt Southerly, ſo the firſt Ship ſteers South 64° 51′ Weſt, or SW. by W. three quarters W. almoſt.

For the ſecond Ship's Courſe.

As AD the ſecond Ship's Diſtance 290m.—————— Co. Ar. 7.537602
To Sine AED 25d. 9m.——————9.628378
So is DE the firſt Ship's Diſtance 306——————2.485721

To Sine DAE 26d. 39m.——————19.651701

The Angle at A is the Courſe from the Eaſt Southerly, ſo the ſecond Ship ſteers South 63 deg. 21 min. Eaſt, or SE by E. ¾ E. nearly.

By the Gunter. *For the Difference of Segments of the Baſe.*

The Extent of the Compaſſes from the Baſe AE 536 min. to the Sum of the Sides 596 min. ſhall reach from the Difference of the Sides 16, to the Difference of Segments of the Baſe 18 min. with which proceed as before.

For the firſt Ship's Courſe.

The Extent from the Diſtance 306 min. to the greater Segment 277m. ſhall reach from Radius or Sine 90d. to Sine 64deg. 51min. the Complement of BED 25 deg. 9 min. required.

For the ſecond Ship's Courſe.

The Extent from 290 min. the ſecond Ship's Diſtance, to 306 min. the firſt Ship's Diſtance, ſhall reach from the Sine 25 deg. 9 min. to the Sine 26 deg. 39 min. the Angle at A required.

PROB. V.

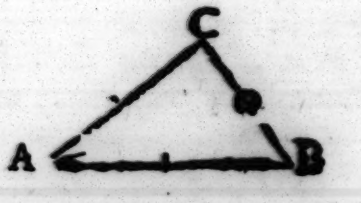
Two Sides and their contained Angle given, to find the third Side.

Example.

Two Ships ſail from one Port at A; the firſt ſails Eaſt 335 Miles to B, the ſecond ſails Eaſt 14 deg. 40 min. North, 271 Miles to C. I demand how far they are aſunder, and what is the Courſe from the Ship at C, to that at B.

In the Triangle ABC,
there is given,

AB 335 }
AC 271 } BC required.
BAC 14° 40′ }



This Caſe requires a double Operation
1. By the 3d Caſe to find the Angles
2. By the 1ſt Caſe to find the Side required.

AC 335
AL 271
Sum is 606
Diff. is 64

The firſt Operation.

As the Sum of the Sides AB and AC 606 Miles —— Co. Ar. 7.217528
To their Difference —— 64 —— 1.806180
So is t. of half ſum of the Angles —— 82° 40′ —— 10.890440
To t. half their Difference —— 39 22 —— 19.914148

By which you will find the Angle ABC, to be 43 deg. 18 min.

The ſecond Operation.

As S. ABC 43d. 18m. —— Co. Ar. 0.163791
To the Side AC 271 Miles —— 2.432969
So is S. BAC 14 deg. 40 min. —— 9.403455
To Side BC 100 Miles —— 12.000215

The Angle at B is found to be 43 deg. 18 min. therefore the Line AB being Eaſt and Weſt, the Courſe from C to B is Eaſt 43 deg. 18 min. S. or S.E. 1 deg. 42 min. Eaſterly. And the Diſtance 100 Miles.

By the Gunter, *for the Angle at* B.

The Extent from 606 Miles the Sum of the ſides, to 64 Miles the difference of the ſides, will reach from the Tang. of 82d. 40m. half the Sum of the unknown Angles; to the Tang. of 39 deg. 22 min. half their difference, which being found, proceed as above to find the Angle at B.

Then the Extent from S. 43d. 18m. the Angle at B, to S. 14d. 40m. the Angle at A; will reach from 271 Miles the ſide AC, to 100 Miles the ſide BC, as above.

Thus much for ſailing by the *Plain Chart*; which being of ſome Uſe in ſhort Voyages, and a good Foundation for further Improvement, we were not willing wholly to omit it; but nevertheleſs would adviſe all that take Charge of Ships never to content themſelves with the Uſe of the *Plain Chart* only; being ſo apparently falſe in itſelf, and ſo unſafe for Practice: Nor are we under any Neceſſity to truſt to it, the Defect thereof being now ſufficiently ſupplied by Mr. *Wright*'s True Chart, commonly called *Mercator*'s, the Projection and Uſe of which (both in ſingle Queſtions and Traverſes) is largely treated of and rendered as eaſy as the *Plain Chart*, in the Book called *Practical Navigation*, firſt ſet forth by Mr. *John Seller*, and now Corrected and Reprinted for Mr. *Mount* and *Page* on *Tower-hill*, with many uſeful Additions.

A Large and very Uſeful

TABLE
OF
DIFFERENCE
OF
Latitude and Departure
IN
MINUTES and Tenth Parts,
TO
Every *Degree* and *Quarter-Point*
OF THE
COMPASS,
For the exact Working of a
TRAVERSE:

LONDON: Printed for WILLIAM MOUNT and
THOMAS PAGE, on *Tower-hill*.

Dist	1 Deg.		2 Deg.		¼ Point		3 Deg.		4 Deg.		5 Deg.		Dist
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.1	01.0	00.1	01.0	00.1	1
2	02.0	00.0	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.2	2
3	03.0	00.1	03.0	00.1	03.0	00.1	03.0	00.2	03.0	00.2	03.0	00.3	3
4	04.0	00.1	04.0	00.1	04.0	00.2	04.0	00.2	04.0	00.3	04.0	00.3	4
5	05.0	00.1	05.0	00.2	05.0	00.2	05.0	00.3	05.0	00.3	05.0	00.4	5
6	06.0	00.1	06.0	00.2	06.0	00.3	06.0	00.3	06.0	00.4	06.0	00.5	6
7	07.0	00.1	07.0	00.2	07.0	00.3	07.0	00.4	07.0	00.5	07.0	00.6	7
8	08.0	00.1	08.0	00.3	08.0	00.4	08.0	00.4	08.0	00.6	08.0	00.7	8
9	09.0	00.2	09.0	00.3	09.0	00.4	09.0	00.5	09.0	00.6	09.0	00.8	9
10	10.0	00.2	10.0	00.4	10.0	00.5	10.0	00.5	10.0	00.7	10.0	00.9	10
11	11.0	00.2	11.0	00.4	11.0	00.5	11.0	00.6	11.0	00.8	11.0	01.0	11
12	12.0	00.2	12.0	00.4	12.0	00.6	12.0	00.6	12.0	00.8	12.0	01.0	12
13	13.0	00.2	13.0	00.5	13.0	00.6	13.0	00.7	13.0	00.9	12.9	01.1	13
14	14.0	00.2	14.0	00.5	14.0	00.7	14.0	00.7	14.0	01.0	13.9	01.2	14
15	15.0	00.3	15.0	00.5	15.0	00.7	15.0	00.8	15.0	01.0	14.9	01.3	15
16	16.0	00.3	16.0	00.6	16.0	00.8	16.0	00.8	16.0	01.1	15.9	01.4	16
17	17.0	00.3	17.0	00.6	17.0	00.8	17.0	00.9	17.0	01.2	16.9	01.5	17
18	18.0	00.3	18.0	00.6	18.0	00.9	18.0	00.9	18.0	01.3	17.9	01.6	18
19	19.0	00.3	19.0	00.7	19.0	00.9	19.0	01.0	19.0	01.3	18.9	01.7	19
20	20.0	00.4	20.0	00.7	20.0	01.0	20.0	01.0	20.0	01.4	19.9	01.7	20
21	21.0	00.4	21.0	00.7	21.0	01.0	21.0	01.1	20.9	01.5	20.9	01.8	21
22	22.0	00.4	22.0	00.8	22.0	01.1	22.0	01.1	21.9	01.5	21.9	01.9	22
23	23.0	00.4	23.0	00.8	23.0	01.1	23.0	01.2	22.9	01.6	22.9	02.0	23
24	24.0	00.4	24.0	00.8	24.0	01.2	24.0	01.3	23.9	01.7	23.9	02.1	24
25	25.0	00.4	25.0	00.9	25.0	01.2	25.0	01.3	24.9	01.7	24.9	02.2	25
26	26.0	00.5	26.0	00.9	26.0	01.3	26.0	01.4	25.9	01.8	25.9	02.3	26
27	27.0	00.5	27.0	00.9	27.0	01.3	27.0	01.4	26.9	01.9	26.9	02.4	27
28	28.0	00.5	28.0	01.0	28.0	01.4	28.0	01.5	27.9	02.0	27.9	02.4	28
29	29.0	00.5	29.0	01.0	29.0	01.4	29.0	01.5	28.9	02.0	28.9	02.5	29
30	30.0	00.5	30.0	01.1	30.0	01.5	30.0	01.6	29.9	02.1	29.9	02.6	30
31	31.0	00.5	31.0	01.1	31.0	01.5	31.0	01.6	30.9	02.2	30.9	02.7	31
32	32.0	00.6	32.0	01.1	32.0	01.6	32.0	01.7	31.9	02.2	31.9	02.8	32
33	33.0	00.6	33.0	01.2	33.0	01.6	33.0	01.7	32.9	02.3	32.9	02.9	33
34	34.0	00.6	34.0	01.2	34.0	01.7	34.0	01.8	33.9	02.4	33.9	03.0	34
35	35.0	00.6	35.0	01.2	35.0	01.7	35.0	01.8	34.9	02.4	34.9	03.1	35
36	36.0	00.6	36.0	01.3	36.0	01.8	35.9	01.9	35.9	02.5	35.9	03.1	36
37	37.0	00.6	37.0	01.3	37.0	01.8	36.9	01.9	36.9	02.6	36.9	03.2	37
38	38.0	00.7	38.0	01.3	38.0	01.9	37.9	02.0	37.9	02.7	37.9	03.3	38
39	39.0	00.7	39.0	01.4	39.0	01.9	38.9	02.0	38.9	02.7	38.9	03.4	39
40	40.0	00.7	40.0	01.4	40.0	02.0	39.9	02.1	39.9	02.8	39.8	03.5	40
41	41.0	00.7	41.0	01.4	41.0	02.0	40.9	02.1	40.9	02.9	40.8	03.6	41
42	42.0	00.7	42.0	01.5	41.9	02.1	41.9	02.2	41.9	02.9	41.8	03.7	42
43	43.0	00.8	43.0	01.5	42.9	02.1	42.9	02.2	42.9	03.0	42.8	03.7	43
44	44.0	00.8	44.0	01.5	43.9	02.2	43.9	02.3	43.9	03.1	43.8	03.8	44
45	45.0	00.8	45.0	01.6	44.9	02.2	44.9	02.4	44.9	03.1	44.8	03.9	45
46	46.0	00.8	46.0	01.6	45.9	02.3	45.9	02.4	45.9	03.2	45.8	04.0	46
47	47.0	00.8	47.0	01.6	46.9	02.3	46.9	02.5	46.9	03.3	46.8	04.1	47
48	48.0	00.8	48.0	01.7	47.9	02.4	47.9	02.5	47.9	03.4	47.8	04.2	48
49	49.0	00.9	49.0	01.7	48.9	02.4	48.9	02.6	48.9	03.4	48.8	04.3	49
50	50.0	00.9	50.0	01.7	49.9	02.5	49.9	02.6	49.9	03.5	49.8	04.4	50
Dist	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist
	89 Deg.		88 Deg.		7¾ Point		87 Deg.		86 Deg.		85 Deg.		

Dist.	1 Deg.		2 Deg.		¼ Point.		3 Deg.		4 Deg.		5 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	51.0	00.9	51.0	01.8	50.9	02.5	50.9	02.7	50.9	03.6	50.8	04.4	51
52	52.0	00.9	52.0	01.8	51.9	02.6	51.9	02.7	51.9	03.6	51.8	04.5	52
53	53.0	00.9	53.0	01.8	52.9	02.6	52.9	02.8	52.9	03.7	52.8	04.6	53
54	54.0	00.9	54.0	01.9	53.9	02.7	53.9	02.8	53.9	03.8	53.8	04.7	54
55	55.0	01.0	55.0	01.9	54.9	02.7	54.9	02.8	54.9	03.8	54.8	04.8	55
56	56.0	01.0	56.0	02.0	55.9	02.7	55.9	02.9	55.9	03.9	55.8	04.9	56
57	57.0	01.0	57.0	02.0	56.9	02.8	56.9	03.0	56.9	04.0	56.8	05.0	57
58	58.0	01.0	58.0	02.0	57.9	02.8	57.9	03.0	57.9	04.0	57.8	05.1	58
59	59.0	01.0	59.0	02.1	58.9	02.9	58.9	03.1	58.9	04.1	58.8	05.1	59
60	60.0	01.1	60.0	02.1	59.9	02.9	59.9	03.1	59.9	04.2	59.8	05.2	60
61	61.0	01.1	61.0	02.1	60.9	03.0	60.9	03.2	60.9	04.3	60.8	05.3	61
62	62.0	01.1	62.0	02.2	61.9	03.0	61.9	03.2	61.9	04.3	61.8	05.4	62
63	63.0	01.1	63.0	02.2	62.9	03.1	62.9	03.3	62.8	04.4	62.8	05.5	63
64	64.0	01.1	64.0	02.3	63.9	03.1	63.9	03.3	63.8	04.5	63.8	05.6	64
65	65.0	01.1	65.0	02.3	64.9	03.2	64.9	03.4	64.8	04.5	64.8	05.7	65
66	66.0	01.2	66.0	02.3	65.9	03.2	65.9	03.5	65.8	04.6	65.7	05.8	66
67	67.0	01.2	67.0	02.3	66.9	03.3	66.9	03.5	66.8	04.7	66.7	05.8	67
68	68.0	01.2	68.0	02.4	67.9	03.3	67.9	03.6	67.8	04.7	67.7	05.9	68
69	69.0	01.2	69.0	02.4	68.9	03.4	68.9	03.6	68.8	04.8	68.7	06.0	69
70	70.0	01.2	70.0	02.4	69.9	03.4	69.9	03.7	69.8	04.9	69.7	06.1	70
71	71.0	01.2	71.0	02.5	70.9	03.5	70.9	03.7	70.8	05.0	70.7	06.2	71
72	72.0	01.3	72.0	02.5	71.9	03.5	71.9	03.8	71.8	05.0	71.7	06.3	72
73	73.0	01.3	73.0	02.5	72.9	03.6	72.9	03.8	72.8	05.1	72.7	06.4	73
74	74.0	01.3	74.0	02.6	73.9	03.6	73.9	03.9	73.8	05.2	73.7	06.5	74
75	75.0	01.3	75.0	02.6	74.9	03.7	74.9	03.9	74.8	05.2	74.7	06.5	75
76	76.0	01.3	76.0	02.7	75.9	03.7	75.9	04.0	75.8	05.3	75.7	06.6	76
77	77.0	01.3	77.0	02.7	76.9	03.8	76.9	04.0	76.8	05.4	76.7	06.7	77
78	78.0	01.4	78.0	02.7	77.9	03.8	77.9	04.1	77.8	05.4	77.7	06.8	78
79	79.0	01.4	79.0	02.8	78.9	03.9	78.9	04.1	78.8	05.5	78.7	06.9	79
80	80.0	01.4	80.0	02.8	79.9	03.9	79.9	04.2	79.8	05.6	79.7	07.0	80
81	81.0	01.4	81.0	02.8	80.9	04.0	80.9	04.2	80.8	05.7	80.7	07.1	81
82	82.0	01.4	81.9	02.9	81.9	04.0	81.9	04.3	81.8	05.7	81.7	07.2	82
83	83.0	01.5	82.9	02.9	82.9	04.1	82.9	04.3	82.8	05.8	82.7	07.2	83
84	84.0	01.5	83.9	02.9	83.9	04.1	83.9	04.4	83.8	05.9	83.7	07.3	84
85	85.0	01.5	84.9	03.0	84.9	04.2	84.9	04.4	84.8	05.9	84.7	07.4	85
86	86.0	01.5	85.9	03.0	85.9	04.2	85.9	04.5	85.8	06.0	85.7	07.5	86
87	87.0	01.5	86.9	03.0	86.9	04.3	86.9	04.6	86.8	06.1	85.7	07.6	87
88	88.0	01.5	87.9	03.1	87.9	04.3	87.9	04.6	87.8	06.1	87.7	07.7	88
89	89.0	01.6	88.9	03.1	88.9	04.4	88.9	04.7	88.8	06.2	88.7	07.8	89
90	90.0	01.6	89.9	03.1	89.9	04.4	89.9	04.7	89.8	06.3	89.7	07.8	90
91	91.0	01.6	90.9	03.2	90.9	04.5	90.9	04.8	90.8	06.4	90.7	07.9	91
92	92.0	01.6	91.9	03.2	91.9	04.5	91.9	04.8	91.8	05.4	91.6	08.0	92
93	93.0	01.6	92.9	03.2	92.9	04.6	92.9	04.9	92.8	06.5	92.6	08.1	93
94	94.0	01.6	93.9	03.3	93.9	04.6	93.9	04.9	93.8	06.6	93.6	08.2	94
95	95.0	01.7	94.9	03.3	94.9	04.7	94.9	05.0	94.8	06.6	94.6	08.3	95
96	96.0	01.7	95.9	03.4	95.9	04.7	95.9	05.0	95.8	06.7	95.6	08.4	96
97	97.0	01.7	96.9	03.4	96.9	04.8	96.9	05.1	96.8	06.8	96.6	08.5	97
98	98.0	01.7	97.9	03.4	97.9	04.8	97.9	05.1	97.8	06.8	97.6	08.5	98
99	99.0	01.7	98.9	03.5	98.9	04.9	98.9	05.2	98.8	06.9	98.6	08.6	99
100	100.0	01.7	99.9	03.5	99.9	04.9	99.9	05.2	99.8	07.0	99.6	08.7	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	89 Deg.		88 Deg.		7¾ Points.		87 Deg.		86 Deg.		85 Deg.		

Dist.	½ Point		6 Deg.		7 Deg.		8 Deg.		¾ Point		9 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.2	1
2	02.0	00.2	02.0	00.2	02.0	00.2	02.0	00.3	02.0	00.3	02.0	00.3	2
3	03.0	00.3	03.0	00.3	03.0	00.4	03.0	00.4	03.0	00.4	03.0	00.5	3
4	04.0	00.4	04.0	00.4	04.0	00.5	04.0	00.6	04.0	00.6	03.9	00.6	4
5	05.0	00.5	05.0	00.5	05.0	00.6	05.0	00.7	04.9	00.7	04.9	00.8	5
6	06.0	00.6	06.0	00.6	06.0	00.7	05.9	00.8	05.9	00.9	05.9	00.9	6
7	07.0	00.7	07.0	00.7	06.9	00.9	06.9	01.0	06.9	01.0	06.9	01.1	7
8	08.0	00.8	08.0	00.8	07.9	01.0	07.9	01.1	07.9	01.2	07.9	01.3	8
9	09.0	00.9	08.9	00.9	08.9	01.1	08.9	01.2	08.9	01.3	08.9	01.4	9
10	10.0	01.0	09.9	01.0	09.9	01.2	09.9	01.4	09.9	01.5	09.9	01.6	10
11	10.9	01.1	10.9	01.1	10.9	01.3	10.9	01.5	10.9	01.6	10.9	01.7	11
12	11.9	01.2	11.9	01.3	11.9	01.5	11.9	01.7	11.9	01.8	11.9	01.9	12
13	12.9	01.3	12.9	01.4	12.9	01.6	12.9	01.8	12.9	01.9	12.8	02.0	13
14	13.9	01.4	13.9	01.5	13.9	01.7	13.9	01.9	13.8	02.1	13.8	02.2	14
15	14.9	01.5	14.9	01.6	14.9	01.8	14.9	02.1	14.8	02.2	14.8	02.3	15
16	15.9	01.6	15.9	01.7	15.9	01.9	15.8	02.2	15.8	02.3	15.8	02.5	16
17	16.9	01.7	16.9	01.8	16.9	02.1	16.8	02.4	16.8	02.5	16.8	02.7	17
18	17.9	01.8	17.9	01.9	17.9	02.2	17.8	02.5	17.8	02.6	17.8	02.8	18
19	18.9	01.9	18.9	02.0	18.9	02.3	18.8	02.6	18.8	02.8	18.8	03.0	19
20	19.9	02.0	19.9	02.1	19.8	02.4	19.8	02.8	19.8	02.9	19.8	03.1	20
21	20.9	02.1	20.9	02.2	20.8	02.6	20.8	02.9	20.8	03.1	20.7	03.3	21
22	21.9	02.2	21.9	02.3	21.8	02.7	21.8	03.1	21.8	03.2	21.7	03.4	22
23	22.9	02.3	22.9	02.4	22.8	02.8	22.8	03.2	22.8	03.4	22.7	03.6	23
24	23.9	02.4	23.9	02.5	23.8	02.9	23.8	03.3	23.7	03.5	23.7	03.8	24
25	24.9	02.4	24.9	02.6	24.8	03.0	24.8	03.5	24.7	03.7	24.7	03.9	25
26	25.9	02.5	25.9	02.7	25.8	03.2	25.7	03.6	25.7	03.8	25.7	04.1	26
27	26.9	02.6	26.9	02.8	26.8	03.3	26.7	03.8	26.7	04.0	26.7	04.2	27
28	27.9	02.7	27.8	02.9	27.8	03.4	27.7	03.9	27.7	04.1	27.7	04.4	28
29	28.9	02.8	28.8	03.0	28.8	03.5	28.1	04.0	28.7	04.3	28.6	04.5	29
30	29.9	02.9	29.8	03.1	29.8	03.7	29.7	04.2	29.7	04.4	29.6	04.7	30
31	30.8	03.0	30.8	03.2	30.8	03.8	30.7	04.3	30.7	04.5	30.6	04.9	31
32	31.8	03.1	31.8	03.3	31.8	03.9	31.7	04.5	31.7	04.7	31.6	05.1	32
33	32.8	03.2	32.8	03.4	32.8	04.0	32.7	04.6	32.6	04.8	32.6	05.2	33
34	33.8	03.3	33.8	03.6	33.7	04.1	33.7	04.7	33.6	05.0	33.6	05.4	34
35	34.8	03.4	34.8	03.7	34.7	04.3	34.7	04.9	34.6	05.1	34.6	05.5	35
36	35.8	03.5	35.8	03.8	35.7	04.4	35.6	05.0	35.6	05.3	35.6	05.6	36
37	36.8	03.6	36.8	03.9	36.7	04.5	36.6	05.1	36.6	05.4	36.5	05.8	37
38	37.8	03.7	37.8	04.0	37.7	04.6	37.6	05.3	37.6	05.6	37.5	05.9	38
39	38.8	03.8	38.8	04.1	38.7	04.8	38.6	05.4	38.6	05.7	38.5	06.1	39
40	39.8	03.9	39.8	04.2	39.7	04.9	39.6	05.6	39.6	05.9	39.5	06.3	40
41	40.8	04.0	40.8	04.3	40.7	05.0	40.6	05.7	40.6	06.0	40.5	06.4	41
42	41.8	04.1	41.8	04.4	41.7	05.1	41.6	05.8	41.5	06.2	41.5	06.6	42
43	42.8	04.2	42.8	04.5	42.7	05.2	42.6	06.0	42.5	06.3	42.5	06.7	43
44	43.8	04.3	43.8	04.6	43.7	05.4	43.6	06.1	43.5	06.5	43.5	06.9	44
45	44.8	04.4	44.8	04.7	44.7	05.5	44.6	06.3	44.5	06.6	44.4	07.0	45
46	45.8	04.5	45.7	04.8	45.7	05.6	45.6	06.4	45.5	06.7	45.4	07.2	46
47	46.8	04.6	46.7	04.9	46.6	05.7	46.5	06.6	46.5	06.9	46.4	07.3	47
48	47.8	04.7	47.7	05.0	47.6	05.9	47.5	06.7	47.5	07.0	47.4	07.5	48
49	48.8	04.8	48.7	05.1	48.6	06.0	48.5	06.8	48.5	07.2	48.4	07.7	49
50	49.8	04.9	49.7	05.2	49.6	06.1	49.5	07.0	49.5	07.3	49.4	07.8	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	7½ Point		84 Deg.		83 Deg.		82 Deg.		7¼ Point		81 Deg.		Dist.

Dist.	½ Point		6 Deg.		7 Deg.		8 Deg.		¾ Point		9 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.8	05.0	50.7	05.3	50.6	06.2	50.5	07.1	50.4	07.5	50.4	08.0	51
52	51.7	05.1	51.7	05.4	51.6	06.3	51.5	07.2	51.4	07.6	51.4	08.1	52
53	52.7	05.2	52.7	05.5	52.6	06.5	52.5	07.4	52.4	07.8	52.3	08.3	53
54	53.7	05.3	53.7	05.6	53.6	06.6	53.5	07.5	53.4	07.9	83 3	08.4	54
55	54.7	05.4	54.7	05.7	54.6	06.7	54.5	07.7	54.4	08.1	54.3	08.6	55
56	55.7	05.5	55.7	05.9	55.6	06.8	55.5	07.8	55.4	08.2	55.3	08.8	56
57	56.7	05.6	56.7	06.0	56.6	06.9	56.4	07.9	56.4	08.4	56.3	08.9	57
58	57.7	05.4	57.7	06.1	57.6	07.1	57.4	08.1	57.4	08.5	57.3	09.1	58
59	58.7	05.8	58.7	06.2	58.6	07.2	58.4	08.2	58.4	08.7	58.3	09.2	59
60	59.7	05.9	59.7	06.3	59.5	07.3	59.4	08.4	59.4	08.8	59.3	09.4	60
61	60.7	06.0	60.7	06.4	60.5	07.4	60.4	08.5	60.3	08.9	60.2	09.5	61
62	61.7	06.1	61.7	06.5	61.5	07.6	61.4	08.6	61.3	09.1	61.2	09.7	62
63	62.7	06.2	62.7	06.6	62.5	07.7	62.4	08.8	62.3	09.2	62.2	09.9	63
64	63.7	06.3	63.6	06.7	63.5	07.8	63.4	08.9	63.3	09.4	63.2	10.0	64
65	64.7	06.4	64.6	06.8	64.5	07.9	64.4	09.0	64.3	09.5	64.2	10.2	65
66	65.7	06.5	65.6	06.9	65.5	08.0	65.4	09.2	65.3	09.7	65.2	10.3	66
67	66.7	06.6	66.6	07.0	66.5	08.2	66.3	09.3	66.3	09.8	66.2	10.5	67
68	67.7	06.7	67.6	07.1	67.5	08.3	67.3	09.5	67.3	10.0	67.2	10.6	68
69	68.7	06.8	68.6	07.2	68.5	08.4	68.3	09.6	68.3	10.1	68.2	10.8	69
70	69.7	06.9	69.6	07.3	69.5	08.5	69.3	09.7	69.2	10.3	69.1	10.9	70
71	70.7	07.0	70.6	07.4	70.5	08.7	70.3	09.9	70.2	10.4	70.1	11.1	71
72	71.7	07.1	71.6	07.5	71.5	08.8	71.3	10.0	71.2	10.6	71.1	11.3	72
73	72.6	07.2	72.6	07.6	72.5	08.9	72.3	10.2	72.2	10.7	72.1	11.4	73
74	73.6	07.3	73.6	07.7	73.4	09.0	73.3	10.3	73.2	10.9	73.1	11.6	74
75	74.6	07.3	74.6	07.8	74.4	09.1	74.3	10.4	74.2	11.0	74.1	11.7	75
76	75.6	07.4	75.6	07.9	75.4	09.3	75.3	10.6	75.2	11.1	75 1	11.9	76
77	76.6	07.5	76.6	08.0	76.4	09.4	76.3	10.7	76.2	11.3	76.1	12.0	77
78	77.6	07.6	77.6	08.1	77.4	09.5	77.2	10.9	77.2	11.4	77.0	12.2	78
79	78.6	07.7	78.6	08.3	78.4	09.6	78.2	11.0	78.1	11.6	78.0	12.4	79
80	79.6	07.8	79.6	08.4	79.4	09.8	79.2	11.1	79.1	11.7	79.0	12.5	80
81	80.6	07.9	80.6	08.5	80.4	09.9	80.2	11.3	80.1	11.9	80.0	12.7	81
82	81.6	08.0	81.5	08.6	81.4	10.0	81.2	11.4	81.1	12.0	81.0	12.8	82
83	82.6	08.1	82.5	08.7	82.4	10.1	82.2	11.6	82.1	12.2	82.0	13.0	83
84	83.6	08.2	83.5	08.8	83.4	10.2	83.2	11.7	83.1	12.3	83.0	13.1	84
85	84.6	08.3	84.5	08.9	84.4	10.4	84.2	11.8	84.1	12.5	84.0	13.3	85
86	85.6	08.4	85.5	09.1	85.4	10.5	85.2	12.0	85.1	12.6	84.9	13.4	86
87	86.6	08.5	86.5	09.0	86.3	10.6	86.2	12.1	86.0	12.8	85.9	13.6	87
88	87.6	08.6	87.5	0,.2	87.3	10.7	87.1	12.2	87.0	12.9	86.9	13.8	88
89	88.6	08.7	88.5	09.3	88.3	10.8	88.1	12.4	88.0	13.1	87.9	13.9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	13.2	88.9	14.1	90
91	90.6	08.9	90.5	09.5	90.3	11.1	90.1	12.7	90.0	13.3	89.9	14.2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12.8	91.0	13.5	90.9	14.4	92
93	92.6	09.1	92.5	09.7	92.3	11.3	92.1	12.9	92.0	13.6	91.9	14.5	93
94	93.5	09.2	93.5	09.8	93.3	11.5	93.1	13.1	93.0	13.8	92.8	14.7	94
95	94.5	09.3	94.5	09.9	94.3	11.6	94.1	13.2	94.0	13.9	93.8	14.9	95
96	95.5	09.4	95.5	10.0	95.3	11.7	95.1	13.4	95.0	14.1	94.8	15.0	96
97	96.5	09.5	96.5	10.1	96.3	11.8	96.1	13.5	96.0	14.2	95.8	15.2	97
98	97.5	09.6	97.5	10.2	97.3	11.9	97.0	13.6	96.9	14.4	96.8	15.3	98
99	98.5	09.7	98.5	10.3	98.3	12.1	98.0	13.8	97.9	14.5	97.8	15.5	99
100	99.5	09.8	99.4	10.4	99.2	12.2	99.0	13.9	98.9	14.7	98.8	15.6	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	7½ Point		84 Deg.		83 Deg.		82 Deg.		7¼ Point		81 Deg.		

Dist.	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	1
2	02.0	00.3	02.0	00.4	02.0	00.4	02.0	00.4	01.9	00.4	01.9	00.5	2
3	03.0	00.5	02.9	00.6	02.9	00.6	02.9	00.6	02.9	00.7	02.9	00.7	3
4	03.9	00.7	03.9	00.8	03.9	00.8	03.9	00.8	03.9	00.9	03.9	01.0	4
5	04.9	00.9	04.9	01.0	04.9	01.0	04.9	01.0	04.9	01.1	04.9	01.2	5
6	05.9	01.0	05.9	01.1	05.9	01.2	05.9	01.2	05.8	01.3	05.8	01.4	6
7	06.9	01.2	06.9	01.3	06.9	01.4	06.8	01.5	06.8	01.6	06.8	01.7	7
8	07.9	01.4	07.9	01.5	07.8	01.6	08.8	01.7	07.8	01.8	07.8	01.9	8
9	08.9	01.6	08.8	01.7	08.8	01.8	07.8	01.9	08.8	02.0	08.7	02.2	9
10	09.8	01.7	09.8	01.9	09.8	02.0	09.8	02.1	09.7	02.2	09.7	02.4	10
11	10.8	01.9	10.8	02.1	10.8	02.1	10.8	02.3	10.7	02.5	10.7	02.7	11
12	11.8	02.1	11.8	02.3	11.8	02.3	11.7	02.5	11.7	02.7	11.6	02.9	12
13	12.8	02.3	12.8	02.5	12.7	02.5	12.7	02.7	12.7	02.9	12.6	03.1	13
14	13.8	02.4	13.7	02.7	13.7	02.7	13.7	02.9	13.6	03.1	13.6	03.4	14
15	14.8	02.6	14.7	02.9	14.7	02.9	14.7	03.1	14.6	03.4	14.6	03.6	15
16	15.8	02.8	15.7	03.1	15.7	03.1	15.6	03.3	15.6	03.6	15.5	03.9	16
17	16.7	03.0	16.7	03.2	16.7	03.3	16.6	03.5	16.6	03.8	16.5	04.1	17
18	17.7	03.1	17.7	03.4	17.7	03.5	17.6	03.7	17.5	04.0	17.5	04.4	18
19	18.7	03.3	18.6	03.6	18.6	03.7	18.6	03.9	18.5	04.3	18.4	04.6	19
20	19.7	03.5	19.6	03.8	19.6	03.9	19.6	04.2	19.5	04.5	19.4	04.8	20
21	20.7	03.6	20.6	04.0	20.6	04.1	20.5	04.4	20.5	04.7	20.4	05.1	21
22	21.7	03.8	21.6	04.2	21.6	04.3	21.5	04.6	21.4	04.9	21.3	05.3	22
23	22.6	04.0	22.6	04.4	22.6	04.5	22.5	04.8	22.4	05.2	22.3	05.6	23
24	23.6	04.2	23.6	04.6	23.5	04.7	23.5	05.0	23.4	05.4	23.3	05.8	24
25	24.6	04.3	24.5	04.8	24.5	04.9	24.5	05.2	24.4	05.6	24.3	06.0	25
26	25.6	04.5	25.5	05.0	25.5	05.1	25.4	05.4	25.3	05.8	25.2	06.3	26
27	26.6	04.7	26.5	05.2	26.5	05.3	26.4	05.6	26.3	06.1	26.2	06.5	27
28	27.6	04.9	27.5	05.3	27.5	05.5	27.4	05.8	27.3	06.3	27.2	06.8	28
29	28.6	05.0	28.3	05.5	28.4	05.7	28.4	06.0	28.3	06.5	28.1	07.0	29
30	29.5	05.2	29.4	05.7	29.4	05.9	29.3	06.2	29.2	06.7	29.1	07.3	30
31	30.5	05.4	30.4	05.9	30.4	06.0	30.3	06.4	30.2	07.0	30.1	07.5	31
32	31.5	05.6	31.4	06.1	31.4	06.2	31.3	06.7	31.2	07.2	31.0	07.7	32
33	32.5	05.7	32.4	06.3	32.4	06.4	52.3	06.9	32.2	07.4	32.0	08.0	33
34	33.5	05.9	33.4	06.5	33.3	06.6	33.3	07.1	33.1	07.6	33.0	08.2	34
35	34.5	06.1	34.4	06.7	34.3	06.8	34.2	07.3	34.1	07.9	34.0	08.5	35
36	35.4	06.2	35.3	06.9	35.3	07.0	35.2	07.5	35.1	08.1	34.9	08.7	36
37	36.4	06.4	36.3	07.1	36.3	07.2	36.2	07.7	36.1	08.3	35.9	09.0	37
38	37.4	06.6	37.3	07.2	37.3	[illegible]	[illegible]	[illegible]	37.0	08.5	36.9	09.2	38
39	38.4	06.8	38.3	07.4	38.3	[illegible]	[illegible]	[illegible]	[illegible]	08.8	37.8	09.4	39
40	39.4	06.9	39.3	07.6	39.2	[illegible]	[illegible]	[illegible]	[illegible]	09.0	58.8	09.7	40
41	40.4	07.1	40.2	07.8	40.2	[illegible]	[illegible]	[illegible]	[illegible]	09.2	39.8	09.9	41
42	41.4	07.3	41.2	08.0	41.2	[illegible]	[illegible]	[illegible]	[illegible]	09.4	40.8	10.2	42
43	42.3	07.5	42.2	08.2	42.2	08.4	[illegible]	[illegible]	[illegible]	09.7	41.7	10.4	43
44	43.3	07.6	43.2	08.4	43.2	08.6	[illegible]	[illegible]	[illegible]	09.9	42.7	10.6	44
45	44.3	07.8	44.2	08.6	44.1	08.8	[illegible]	[illegible]	[illegible]	10.1	43.7	10.9	45
46	45.3	08.0	45.2	08.8	45.1	09.0	45.0	09.6	44.8	10.3	44.6	11.1	46
47	46.3	08.2	46.1	09.0	46.1	09.2	46.0	09.8	45.8	10.6	45.6	11.4	47
48	47.3	08.3	47.1	09.2	47.1	09.4	47.0	10.0	46.8	10.8	46.6	11.6	48
49	48.3	08.5	48.1	09.3	48.1	09.6	47.9	10.2	47.7	11.0	47.5	11.9	49
50	49.2	08.7	49.1	09.5	49.0	09.8	48.9	10.4	48.7	11.2	48.5	12.1	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	80 Deg.		79 Deg.		7 Point		78 Deg.		77 Deg.		76 Deg.		

Dist.	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.2	08.9	50.1	09.7	50.0	10.0	49.9	10.6	49.7	11.5	49.5	12.3	51
52	51.2	09.0	51.0	09.9	51.0	10.1	50.9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	10.1	52.0	10.3	51.8	11.0	51.6	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10.5	52.8	11.2	52.6	12.1	52.4	13.1	54
55	54.2	09.5	54.0	10.5	53.9	10.7	53.8	11.4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.7	54.9	10.9	54.8	11.6	54.6	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.9	55.9	11.1	55.8	11.8	55.5	12.8	55.3	13.8	57
58	57.1	10.1	56.9	11.1	56.9	11.3	56.7	12.1	56.5	13.0	56.3	14.0	58
59	58.1	10.2	57.9	11.3	57.9	11.5	57.7	12.3	57.5	13.3	57.2	14.3	59
60	59.1	10.4	58.9	11.4	58.8	11.7	58.7	12.5	58.5	13.5	58.2	14.5	60
61	60.1	10.6	59.9	11.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14.8	61
62	61.1	10.8	60.9	11.8	60.8	12.1	60.6	12.9	60.4	13.9	60.2	15.0	62
63	62.0	10.9	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15.2	63
64	63.0	11.1	62.8	12.2	62.8	12.5	62.6	13.3	62.4	14.4	62.1	15.5	64
65	64.0	11.3	63.8	12.4	63.8	12.7	63.6	13.5	63.3	14.6	63.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	64.6	13.7	64.3	14.8	64.0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13.9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66.5	14.1	66.3	15.3	66.0	16.4	68
69	68.0	12.0	67.7	13.2	67.7	13.5	67.5	14.3	67.2	15.5	66.9	16.7	69
70	68.9	12.2	68.7	13.4	68.7	13.7	68.5	14.6	68.2	15.7	67.9	16.9	70
71	69.9	[illegible]	[illegible]	13.5	69.6	13.9	69.4	14.8	69.2	16.0	68.9	17.2	71
72	70.9	12.5	[illegible]	13.7	70.6	14.0	70.4	15.0	70.2	16.2	69.9	17.4	72
73	71.9	12.7	[illegible]	13.9	71.6	14.2	71.4	15.2	71.1	16.4	70.8	17.7	73
74	72.9	12.8	72.6	14.1	72.6	14.4	72.4	15.4	72.1	16.6	71.8	17.9	74
75	73.9	13.0	73.6	14.3	73.6	14.6	73.4	15.6	73.1	16.9	72.8	18.1	75
76	74.8	13.2	74.6	14.5	74.5	14.8	74.3	15.8	74.1	17.1	73.7	18.4	76
77	75.8	13.4	75.6	14.7	75.5	15.0	75.3	16.0	75.0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14.9	76.5	15.2	76.3	16.2	76.0	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17.8	76.7	19.1	79
80	78.8	13.9	78.5	15.3	78.5	15.6	78.2	16.6	78.0	18.0	77.6	19.4	80
81	79.8	14.1	79.5	15.5	79.4	15.8	79.2	16.8	78.9	18.2	78.6	19.6	81
82	80.8	14.2	80.5	15.6	80.4	16.0	80.2	17.0	79.9	18.4	79.6	19.8	82
83	81.7	14.4	81.5	15.8	81.4	16.2	81.2	17.3	80.9	18.7	80.5	20.1	83
84	82.7	14.6	82.5	16.0	82.4	16.4	82.2	17.5	81.8	18.9	81.5	20.3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14.9	84.4	16.4	84.3	16.8	84.1	17.9	83.8	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85.1	18.1	84.8	19.6	84.4	21.0	87
88	86.7	15.3	86.4	16.8	86.3	17.2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18.5	86 7	20.0	86.4	21.5	89
90	88.6	15.6	88.3	17.2	88.3	17.6	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.4	89.3	17.8	89.0	18.9	88.7	20.5	88.3	22.0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90.0	19.1	89.6	20.7	89.3	22.3	92
93	91.6	16.1	91.3	17.7	91.2	18.1	91.0	19.3	90.6	20.9	90.2	22.5	93
94	92.6	16.3	92.3	17.9	92.2	18.3	91.9	19.5	91.6	21.1	91.2	22.7	94
95	93.6	16.5	93.3	18.1	93.2	18.5	92.9	19.7	92.6	21.4	92.2	23.0	95
96	94.5	16.7	94.2	18.3	94.2	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95.2	18.5	95.1	18.9	94.9	20.2	94.5	21.8	94.1	23.5	97
98	96.5	17.0	96.2	18.7	96.1	19.1	95.9	20.4	95.5	22.0	95.1	23.7	98
99	97.5	17.2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.3	96.1	24.0	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20.8	97.4	22.5	97.0	24.2	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	80 Deg.		79 Deg.		7 Points		78 Deg.		77 Deg.		76 Deg.		

Dist	1 ¼ Point		15 Deg.		16 Deg.		1 ½ Point		17 Deg.		18 Deg.		Dist
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.6	01.9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.9	00.9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01.2	04.8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01.5	05.8	01.7	05.7	01.7	05.7	01.8	05.7	01.9	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08.7	02.5	08.6	02.6	08.6	02.6	08.6	02.8	9
10	09.7	02.4	09.7	02.6	09.6	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10.7	02.7	10.6	02.8	10.6	03.0	10.5	03.2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14.5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	03.9	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.3	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.6	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05.5	18.2	05.6	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06.1	20.1	06.1	20.0	06.5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.1	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07.1	23
24	23.3	05.8	23.2	06.2	23.1	06.6	23.0	07.0	22.9	07.0	22.8	07.4	24
25	24.2	06.1	24.1	06.5	24.0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	06.3	25.1	06.7	25.0	07.2	24.9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	26.0	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.2	06.8	27.0	07.2	26.9	07.7	26.8	08.1	26.8	08.2	26.6	08.7	28
29	28.1	07.0	28.0	07.5	27.9	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08.5	29.7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.8	30.9	08.3	30.8	08.8	30.6	09.3	30.6	09.4	30.4	10.0	32
33	32.0	08.0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09.9	32.3	10.5	34
35	33.9	08.5	33.8	09.1	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34.9	08.7	34.8	09.3	34.6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.2	37
38	36.9	09.2	36.7	09.8	36.5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10.4	38.5	10.0	38.3	11.6	38.3	11.7	38.0	12.4	40
41	39.8	10.0	39.6	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40.6	10.9	40.4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.4	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.3	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.4	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	13.0	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.1	13.2	45.9	13.9	45.9	14.0	45.7	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.6	15.4	50
Dist	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist
	6 ¾ Point		75 Deg.		74 Deg.		6 ½ Point		73 Deg.		72 Deg.		

Dist.	1¼ Point		15 Deg.		16 Deg.		1½ Point		17 Deg.		18 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	49.5	12.4	49.3	13.2	49.0	14.1	48.8	14.8	48.8	14.9	48.5	15.8	51
52	50.4	12.6	50.2	13.5	50.0	14.3	49.7	15.1	49.7	15.2	49.4	16.1	52
53	51.4	12.9	51.2	13.7	50.9	14.6	50.7	15.3	50.7	15.5	50.4	16.4	53
54	52.4	13.1	52.2	14.0	51.9	14.9	51.7	15.7	51.6	15.8	51.3	16.7	54
55	53.3	13.4	53.1	14.2	52.9	15.2	52.6	16.0	52.6	16.1	52.3	17.0	55
56	54.3	13.6	54.1	14.5	53.8	15.4	53.6	16.2	53.5	16.4	53.3	17.3	56
57	55.3	13.9	55.1	14.8	54.8	15.7	54.5	16.5	54.5	16.7	54.2	17.6	57
58	56.3	14.1	56.0	15.0	55.8	16.0	55.5	16.8	55.5	17.0	55.2	17.9	58
59	57.2	14.3	57.0	15.3	56.7	16.3	56.5	17.1	56.4	17.3	56.1	18.2	59
60	58.2	14.6	58.0	15.5	57.7	16.5	57.4	17.4	57.4	17.5	57.1	18.5	60
61	59.2	14.8	58.9	15.8	58.6	16.8	58.4	17.7	58.3	17.8	58.0	18.8	61
62	60.1	15.1	59.9	16.0	59.6	17.1	59.3	18.0	59.3	18.1	59.0	19.2	62
63	61.1	15.3	60.9	16.3	60.6	17.4	60.3	18.3	60.2	18.4	59.9	19.5	63
64	62.1	15.6	61.8	16.6	61.5	17.6	61.2	18.6	61.2	18.7	60.9	19.8	64
65	63.0	15.8	62.8	16.8	62.5	17.9	62.2	18.9	62.2	19.0	61.8	20.1	65
66	64.0	16.0	63.7	17.1	63.4	18.2	63.2	19.2	63.1	19.3	62.8	20.4	66
67	65.0	16.3	64.7	17.3	64.4	18.5	64.1	19.4	64.1	19.6	63.7	20.7	67
68	66.0	16.5	65.7	17.6	65.4	18.7	65.1	19.7	65.0	19.9	64.7	21.0	68
69	66.9	16.8	66.6	17.9	66.3	19.0	66.0	20.0	66.0	20.2	65.6	21.3	69
70	67.9	17.0	67.6	18.1	67.3	19.3	67.0	20.3	66.9	20.5	66.6	21.6	70
71	68.9	17.3	68.6	18.4	68.3	19.6	67.9	20.6	67.9	20.8	67.5	21.9	71
72	69.8	17.5	69.5	18.6	69.2	19.8	68.9	20.9	68.8	21.1	68.5	22.2	72
73	70.8	17.7	70.5	18.9	70.2	20.1	69.9	21.2	69.8	21.3	69.4	22.6	73
74	71.8	18.0	71.5	19.2	71.1	20.4	70.8	21.5	70.8	21.6	70.4	22.9	74
75	72.7	18.2	72.4	19.4	72.1	20.7	71.8	21.8	71.7	21.9	71.3	23.2	75
76	73.7	18.5	73.4	19.7	73.1	20.9	72.7	22.1	72.7	22.2	72.3	23.5	76
77	74.7	18.7	74.4	19.9	74.0	21.2	73.7	22.4	73.6	22.5	73.2	23.8	77
78	75.7	19.0	75.3	20.2	75.0	21.5	74.6	22.6	74.6	22.8	74.2	24.1	78
79	76.6	19.2	76.3	20.4	75.9	21.8	75.6	22.9	75.5	23.1	75.1	24.4	79
80	77.6	19.4	77.3	20.7	76.9	22.0	76.6	23.2	76.5	23.4	76.1	24.7	80
81	78.6	19.7	78.2	21.0	77.9	22.3	77.5	23.5	77.5	23.7	77.0	25.0	81
82	79.5	19.9	79.2	21.2	78.8	22.6	78.5	23.8	78.4	24.0	78.0	25.3	82
83	80.5	20.2	80.2	21.3	79.8	22.9	79.4	24.1	79.4	24.3	78.9	25.6	83
84	81.5	20.4	81.1	21.7	80.7	23.1	80.4	24.4	80.3	24.5	79.9	26.0	84
85	82.4	20.7	82.1	22.0	81.7	23.4	81.3	24.7	81.3	24.8	[illegible]	[illegible]	85
86	83.4	20.9	83.1	22.3	82.7	23.7	82.3	25.0	82.2	25.1	81.8	26.6	86
87	84.4	21.1	84.0	22.5	83.6	24.0	83.3	25.3	83.2	25.4	82.7	26.9	87
88	85.4	21.4	85.0	22.8	84.6	24.3	84.2	25.5	84.2	25.7	83.7	27.2	88
89	86.3	21.6	86.0	23.0	85.6	24.5	85.2	25.8	85.1	26.0	84.6	[illegible]	89
90	87.3	21.9	86.9	23.3	86.5	24.8	86.1	26.1	86.1	26.3	85.6	27.8	90
91	88.3	22.1	87.9	23.3	87.5	25.1	87.1	26.4	87.0	26.6	86.5	28.1	91
92	89.2	22.4	88.9	23.8	88.4	25.4	88.0	26.7	88.0	26.9	87.5	[illegible]	92
93	90.2	22.6	89.8	24.1	89.4	25.6	89.0	27.0	88.9	27.2	88.4	[illegible]	93
94	91.2	22.8	90.8	24.3	90.4	25.9	90.0	27.3	89.9	27.5	89.4	[illegible]	94
95	92.1	23.1	91.8	24.6	91.3	26.2	90.9	27.6	90.8	27.8	90.4	[illegible]	95
96	93.1	23.3	92.7	24.8	92.3	26.5	91.9	27.9	91.8	28.1	91.3	29.7	96
97	94.1	23.6	93.7	25.1	93.2	26.7	92.8	28.2	92.8	28.4	92.3	30.0	97
98	95.1	23.8	94.7	25.4	94.2	27.0	93.8	28.4	93.7	28.7	93.2	[illegible]	98
99	96.0	24.1	95.6	25.6	95.2	27.3	94.7	28.7	94.7	[illegible]	94.2	[illegible]	99
100	97.0	24.3	96.6	25.9	96.1	27.6	95.7	29.0	95.6	29.2	[illegible]	[illegible]	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	6¾ Points		75 Deg.		74 Deg.		6½ Points		73 Deg.		72 Deg.		

Dist.	19 Deg.		1 ¾ Point		20 Deg.		21 Deg.		22 Deg.		2 Points		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.8	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.4	03.7	01.5	03.7	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.8	04.6	01.9	04.6	01.9	5
6	05.7	02.0	05.6	02.0	05.6	02.1	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	06.6	02.4	06.6	02.4	06.5	02.5	06.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03.1	8
9	08.5	02.9	08.5	03.0	08.5	03.1	08.4	03.2	08.3	03.4	08.3	03.4	9
10	09.5	03.3	09.4	03.4	09.4	03.4	09.3	03.6	09.3	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04.3	11.1	04.5	11.1	04.6	12
13	12.3	04.2	12.2	04.4	12.2	04.4	12.1	04.7	12.1	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.0	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14.0	05.4	13.9	05.6	13.9	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.5	14.9	05.7	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.2	16.8	06.5	16.7	06.7	16.6	06.9	18
19	18.0	06.2	17.9	06.4	17.9	06.5	17.7	06.8	17.6	07.1	17.6	07.3	19
20	18.9	06.5	18.8	06.7	18.8	06.8	18.7	07.2	18.5	07.5	18.5	07.7	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.6	08.2	22.4	08.6	22.3	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09.0	23.2	09.4	23.1	09.6	25
26	24.6	08.6	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.4	09.2	25.2	09.7	25.0	10.1	24.9	10.2	27
28	26.5	09.1	26.4	09.4	26.3	09.6	26.1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.3	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.8	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.1	10.6	28.9	11.1	28.7	11.6	28.6	11.9	31
32	30.3	10.4	30.1	10.8	30.1	10.9	29.9	11.5	29.7	12.0	29.6	12.3	32
33	31.2	10.7	31.1	11.1	31.0	11.3	30.8	11.8	30.6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.5	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.4	13.5	33.3	13.8	36
37	35.0	12.0	34.8	12.5	34.8	12.7	34.6	13.3	34.3	13.9	34.2	14.2	37
38	35.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.2	14.2	35.1	14.5	38
39	36.9	12.7	36.7	13.1	36.6	13.3	36.4	14.0	36.2	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.1	15.0	37.0	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38.0	15.4	37.9	15.7	41
42	39.7	13.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.7	38.8	16.1	42
43	40.7	14.0	40.5	14.5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	16.5	43
44	41.6	14.3	41.4	14.8	41.3	15.0	41.1	15.8	40.8	16.5	40.7	16.8	44
45	42.5	14.7	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.9	41.6	17.2	45
46	43.5	15.0	43.3	15.5	43.2	15.7	42.9	16.5	42.7	17.2	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.8	43.6	17.5	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.2	44.5	18.0	44.3	18.4	48
49	46.3	16.0	46.1	16.5	46.0	16.8	45.7	17.6	45.4	18.4	45.3	18.8	49
50	47.3	16.3	47.1	16.8	47.0	17.1	46.7	17.9	46.4	18.7	46.2	19.1	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	71 Deg.		6 ¼ Point		70 Deg.		69 Deg.		68 Deg.		6 Points		

Dist.	19 Deg.		1¾ Point		20 Deg.		21 Deg.		22 Deg.		2 Point		Dist.
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
51	48.2	16.6	48.0	17.2	47.9	17.4	47.6	18.3	47.3	19.1	47.1	19.5	51
52	49.2	16.9	49.0	17.5	48.9	17.8	48.5	18.6	48.2	19.5	48.0	19.9	52
53	50.1	17.3	49.9	17.9	49.8	18.1	49.5	19.0	49.1	19.9	49.0	20.3	53
54	51.0	17.6	50.8	18.2	50.7	18.5	50.4	19.4	50.1	20.2	49.9	20.7	54
55	52.0	17.9	51.8	18.5	51.7	18.8	51.3	19.7	51.0	20.6	50.8	21.0	55
56	52.9	18.2	52.7	18.9	52.6	19.2	52.3	20.1	51.9	21.0	51.7	21.4	56
57	53.9	18.6	53.7	19.2	53.6	19.5	53.2	20.4	52.8	21.4	52.7	21.8	57
58	54.8	18.9	54.6	19.5	54.5	19.8	54.1	20.8	53.8	21.7	53.6	22.2	58
59	55.8	19.2	55.5	19.9	55.4	20.2	55.1	21.1	54.7	22.1	54.5	22.6	59
60	56.7	19.5	56.5	20.2	56.4	20.5	56.0	21.5	55.6	22.5	55.4	23.0	60
61	57.7	19.9	57.4	20.6	57.3	20.9	56.9	21.9	56.5	22.8	56.4	23.3	61
62	58.6	20.2	58.4	20.9	58.3	21.2	57.9	22.2	57.5	23.2	57.3	23.7	62
63	59.6	20.5	59.3	21.2	59.2	21.5	58.8	22.6	58.4	23.6	58.2	24.1	63
64	60.5	20.8	60.3	21.6	60.1	21.9	59.7	22.9	59.3	24.0	59.1	24.5	64
65	61.5	21.2	61.2	21.9	61.1	22.2	60.7	23.3	60.3	24.3	60.1	24.9	65
66	62.4	21.5	62.1	22.2	62.0	22.6	61.6	23.7	61.2	24.7	61.0	25.3	66
67	63.3	21.8	63.1	22.6	63.0	22.9	62.6	24.0	62.1	25.1	61.9	25.6	67
68	64.3	22.1	64.0	22.9	63.9	23.3	63.5	24.4	63.0	25.5	62.8	26.0	68
69	65.2	22.5	65.0	23.2	64.8	23.6	64.4	24.7	64.0	25.8	63.7	26.4	69
70	66.2	22.8	65.9	23.6	65.8	23.9	65.4	25.1	64.9	26.2	64.7	26.8	70
71	67.1	23.1	66.8	23.9	66.7	24.3	66.3	25.4	65.8	26.6	65.6	27.2	71
72	68.1	23.4	67.8	24.3	67.7	24.6	67.2	25.8	66.8	27.0	66.5	27.6	72
73	69.0	23.8	68.7	24.6	68.6	25.0	68.2	26.2	67.7	27.3	67.4	27.9	73
74	70.0	24.1	69.7	24.9	69.5	25.3	69.1	26.5	68.6	27.7	68.4	28.3	74
75	70.9	24.4	70.6	25.3	70.5	25.6	70.0	26.9	69.5	28.1	69.3	28.7	75
76	71.9	24.7	71.6	25.6	71.4	26.0	71.0	27.2	70.5	28.5	70.2	29.1	76
77	72.8	25.1	72.5	25.9	72.4	26.3	71.9	27.6	71.4	28.8	71.1	29.5	77
78	73.7	25.4	73.4	26.3	73.3	26.7	72.8	28.0	72.3	29.2	72.1	29.8	78
79	74.7	25.7	74.4	26.6	74.2	27.0	73.8	28.3	73.2	29.6	73.0	30.2	79
80	75.6	26.0	75.3	27.0	75.2	27.4	74.7	28.7	74.2	30.0	73.9	30.6	80
81	76.6	26.4	76.3	27.3	76.1	27.7	75.6	29.0	75.1	30.3	74.8	31.0	81
82	77.5	26.7	77.2	27.6	77.1	28.0	76.6	29.4	76.0	30.7	75.8	31.4	82
83	78.5	27.0	78.1	28.0	78.0	28.4	77.5	29.7	77.0	31.1	76.7	31.8	83
84	79.4	27.3	79.1	28.3	78.9	28.7	78.4	30.1	77.9	31.5	77.6	32.1	84
85	80.4	27.7	80.0	28.6	79.9	29.1	79.4	30.5	78.8	31.8	78.5	32.5	85
86	81.3	28.0	81.0	29.0	80.8	29.4	80.3	30.8	79.7	32.2	79.5	32.9	86
87	82.3	28.3	81.9	29.3	81.8	29.8	81.2	31.2	80.7	32.6	80.4	33.3	87
81	83.2	28.7	82.9	29.6	82.7	30.1	82.2	31.5	81.6	33.0	81.3	33.7	88
89	84.1	29.0	83.8	30.0	83.6	30.4	83.1	31.9	82.5	33.3	82.2	34.1	89
90	85.1	29.3	84.7	30.3	84.6	30.8	84.0	32.3	83.4	33.7	83.2	34.4	90
91	86.0	29.6	85.7	30.7	85.5	31.1	85.0	32.6	84.4	34.1	84.1	34.8	91
92	87.0	30.0	86.6	31.0	86.5	31.5	85.9	33.0	85.3	34.5	85.0	35.2	92
93	87.9	30.3	87.6	31.3	87.4	31.8	86.8	33.3	86.2	34.8	85.9	35.6	93
94	88.9	30.6	88.5	31.7	88.3	32.1	87.8	33.7	87.2	35.2	86.8	36.0	94
95	89.8	30.9	89.4	32.0	89.3	32.5	88.7	34.0	88.1	35.6	87.8	36.4	95
96	90.8	31.3	90.4	32.3	90.2	32.8	89.6	34.4	89.0	36.0	88.7	36.7	96
97	91.7	31.6	91.3	32.7	91.1	33.2	90.6	34.8	89.9	36.3	89.6	37.1	97
98	92.7	31.9	92.2	33.0	92.1	33.5	91.5	35.1	90.9	36.7	90.5	37.5	98
99	93.6	32.2	93.2	33.4	93.0	33.9	92.4	35.5	91.8	37.1	91.5	37.9	99
100	94.5	32.6	94.2	33.7	94.0	34.2	93.4	35.8	92.7	37.5	92.4	38.3	100
	Dep	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	
Dist.	71 Deg.		6¼ Point		70 Deg.		69 Deg.		68 Deg.		6 Point		Dist.

Dist	23 Deg.		24 Deg.		25 Deg.		2¼ Point		26 Deg.		27 Deg.		Dist
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.5	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.7	01.6	03.6	01.7	03.6	01.7	03.6	01.8	03.6	01.8	4
5	04.6	02.0	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.3	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.2	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.8	05.6	11.7	05.7	11.6	05.9	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	06.0	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	06.8	14.4	06.9	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.5	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.5	18.1	08.6	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.9	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.3	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.6	19.6	10.0	22
23	21.2	09.0	21.0	09.4	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.8	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.8	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.9	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.2	26.7	13.6	30
31	28.5	12.1	28.3	12.6	28.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.8	14.1	29.7	14.5	29.4	15.0	33
34	31.3	13.3	31.1	13.8	30.8	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	31.7	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.6	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.5	33.8	15.0	33.5	15.6	33.4	15.8	33.3	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.5	34.4	16.1	34.4	16.2	34.2	16.7	33.9	17.3	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.1	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.3	16.9	36.2	17.1	36.0	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.4	38.6	18.9	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	39.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.6	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.5	43.1	21.0	42.8	21.8	48
49	45.1	19.1	44.8	19.9	44.4	20.7	44.3	20.9	44.0	21.5	43.7	22.2	49
50	46.0	19.5	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.9	44.5	22.7	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist	67 Deg.		66 Deg.		65 Deg.		5½ Point		64 Deg.		63 Deg.		Dist

Dist.	23 Deg.		24 Deg.		25 Deg.		2¼ Point		26 Deg.		27 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	46.9	19.9	46.6	20.7	46.2	21.6	46.1	21.8	45.8	22.4	45.4	23.2	51
52	47.9	20.3	47.5	21.1	47.1	22.0	47.0	22.2	46.7	22.8	46.3	23.6	52
53	48.8	20.7	48.4	21.6	48.0	22.4	47.9	22.7	47.6	23.2	47.2	24.1	53
54	49.7	21.1	49.3	22.0	48.9	22.8	48.8	23.1	48.5	23.7	48.1	24.5	54
55	50.6	21.5	50.2	22.4	49.8	23.2	49.7	23.5	49.4	24.1	49.0	25.0	55
56	51.5	21.9	51.2	22.8	50.8	23.7	50.6	23.9	50.3	24.5	49.9	25.4	56
57	52.5	22.3	52.1	23.2	51.7	24.1	51.5	24.4	51.2	25.0	50.8	25.9	57
58	53.4	22.7	53.0	23.6	52.6	24.5	52.4	24.8	52.1	25.4	51.7	26.3	58
59	54.3	23.1	53.9	24.0	53.5	24.9	53.3	25.2	53.0	25.9	52.6	26.8	59
60	55.2	23.4	54.8	24.4	54.4	25.4	54.2	25.7	53.9	26.3	53.5	27.2	60
61	56.1	23.8	55.7	24.8	55.3	25.8	55.1	26.1	54.8	26.7	54.4	27.7	61
62	57.1	24.2	56.6	25.2	56.2	26.2	56.0	26.5	55.7	27.2	55.2	28.1	62
63	58.0	24.6	57.5	25.6	57.1	26.6	57.0	26.9	56.6	27.6	56.1	28.6	63
64	58.9	25.0	58.5	26.0	58.0	27.0	57.9	27.4	57.5	28.1	57.0	29.1	64
65	59.8	25.4	59.4	26.4	58.9	27.5	58.8	27.8	58.4	28.5	57.9	29.5	65
66	60.8	25.8	60.3	26.8	59.8	27.9	59.7	28.2	59.3	28.9	58.8	30.0	66
67	61.7	26.2	61.2	27.2	60.7	28.3	60.6	28.6	60.2	29.4	59.7	30.4	67
68	62.6	26.6	62.1	27.7	61.6	28.7	61.5	29.1	61.1	29.8	60.6	30.9	68
69	63.5	27.0	63.0	28.1	62.5	29.2	62.4	29.5	62.0	30.2	61.5	31.3	69
70	64.4	27.3	63.9	28.5	63.4	29.6	63.3	29.9	62.9	30.7	62.4	31.8	70
71	65.4	27.7	64.9	28.9	64.3	30.0	64.2	30.4	63.8	31.1	63.3	32.2	71
72	66.3	28.1	65.8	29.3	65.3	30.4	65.1	30.8	64.7	31.6	64.2	32.7	72
73	67.2	28.5	66.7	29.7	66.2	30.8	66.0	31.2	65.6	32.0	65.0	33.1	73
74	68.1	28.9	67.6	30.1	67.1	31.3	66.9	31.6	66.5	32.4	65.9	33.6	74
75	69.0	29.3	68.5	30.5	68.0	31.7	67.8	32.1	67.4	32.9	66.8	34.1	75
76	70.0	29.7	69.4	30.9	68.9	32.1	68.7	32.5	68.3	33.3	67.7	34.5	76
77	70.9	30.1	70.3	31.3	69.8	32.5	69.6	32.9	69.2	33.8	68.6	35.0	77
78	71.8	30.5	71.3	31.7	70.7	33.0	70.5	33.4	70.1	34.2	69.5	35.4	78
79	72.7	30.9	72.2	32.1	71.6	33.4	71.4	33.8	71.0	34.6	70.4	35.9	79
80	73.6	31.3	73.1	32.5	72.5	33.8	72.3	34.2	71.9	35.1	71.3	36.3	80
81	74.6	31.6	74.0	32.9	73.4	34.2	73.2	34.6	72.8	35.5	72.2	36.8	81
82	75.5	32.0	74.9	33.3	74.3	34.7	74.1	35.1	73.7	35.9	73.1	37.2	82
83	76.4	32.4	75.8	33.7	75.2	35.1	75.0	35.5	74.6	36.4	74.0	37.7	83
84	77.3	32.8	76.7	34.1	76.1	35.5	75.9	35.9	75.5	36.8	74.8	38.1	84
85	78.2	33.2	77.6	34.6	77.0	35.9	76.8	36.3	76.4	37.3	75.7	38.6	85
86	79.2	33.6	78.6	35.0	77.9	36.3	77.7	36.8	77.3	37.7	76.6	39.0	86
87	80.1	34.0	79.5	35.4	78.8	36.8	78.6	37.2	78.2	38.1	77.5	39.5	87
88	81.0	34.4	80.4	55.8	79.8	37.2	79.6	37.6	79.1	38.6	78.4	40.0	88
89	81.9	34.8	81.3	36.2	80.7	37.6	80.5	38.1	80.0	39.0	79.3	40.4	89
90	82.8	35.2	82.2	36.6	81.6	38.0	81.4	38.5	80.9	39.5	80.2	40.9	90
91	83.8	35.6	83.1	37.0	82.5	38.5	82.3	38.9	81.8	39.9	81.1	41.3	91
92	84.7	35.9	84.0	37.4	83.4	38.9	83.2	39.3	82.7	40.3	82.0	41.8	92
93	85.6	36.3	85.0	37.8	84.3	39.3	84.1	39.8	83.6	40.8	82.9	42.2	93
94	86.5	36.7	85.9	38.2	85.2	39.7	85.0	40.2	84.5	41.2	83.8	42.7	94
95	87.4	37.1	86.8	38.6	86.1	40.1	85.9	40.6	85.4	41.6	84.6	43.1	95
96	88.3	37.5	87.7	39.0	87.0	40.6	86.8	41.0	86.3	42.1	85.5	43.6	96
97	89.3	37.9	88.6	39.4	87.9	41.0	87.7	41.5	87.2	42.5	86.4	44.0	97
98	90.2	38.4	89.5	39.9	88.8	41.4	88.6	41.9	88.1	43.0	87.3	44.5	98
99	91.1	38.7	90.4	40.3	89.7	41.8	89.5	42.3	89.0	43.4	88.2	44.9	99
100	92.0	39.1	91.4	40.7	90.6	42.3	90.4	42.8	89.9	43.8	89.1	45.4	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	67 Deg.		66 Deg.		65 Deg.		5¾ Point		64 Deg.		63 Deg.		

Dist	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¾ Points		31 Deg.		Dist
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	1
2	01.8	00.9	01.8	00.9	01.7	01.0	01.7	01.0	01.7	01.0	01.7	01.0	2
3	02.6	01.4	02.6	01.4	02.6	01.5	02.6	01.5	02.6	01.5	02.6	01.5	3
4	03.5	01.9	03.5	01.9	03.5	01.9	03.5	02.0	03.4	02.1	03.4	02.1	4
5	04.4	02.3	04.4	02.4	04.4	02.4	04.3	02.5	04.3	02.6	04.3	02.6	5
6	05.3	02.8	05.3	02.8	05.2	02.9	05.2	03.0	05.1	03,1	05.1	03.1	6
7	06.2	03.3	06.2	03.3	06.1	03.4	06.1	03.5	06.0	03.6	06.0	03.6	7
8	07.1	03.8	07.1	03.8	07.0	03.9	06.9	04.0	06.9	04.1	06.9	04.1	8
9	07.9	04.2	07.9	04.2	07.9	04.4	07.8	04.5	07.7	04.6	07.7	04.6	9
10	08.8	04.7	08.8	04.7	08.7	04.8	08.7	05.0	08.6	05.1	08.6	05.1	10
11	09.7	05.2	09.7	05.2	09.6	05.3	09.5	05.5	09.4	05.7	09.4	05.7	11
12	10.6	05.6	10.6	05.7	10.5	05.8	10.4	06.0	10.3	06.2	10.3	06.2	12
13	11.5	06.1	11.5	06.1	11.4	06.3	11.3	06.5	11.1	06.7	11.1	06.7	13
14	12.4	06.6	12.3	06.6	12.2	06.8	12.1	07.0	12.0	07.2	12.0	07.2	14
15	13.2	07.0	13.2	07.1	13.1	07.3	13.0	07.5	12.9	07.7	12.9	07.7	15
16	14.1	07.5	14.1	07.5	14.0	07.8	13.9	08.0	13.7	08.2	13.7	08.2	16
17	15.0	08.0	15.0	08.0	14.9	08.2	14.7	08.5	14.6	08.7	14.6	08.8	17
18	15.9	08.5	15.9	08.5	15.7	08.7	15.6	09.0	15.4	09.3	15.4	09.3	18
19	16.8	08.9	16.8	09.0	16.6	09.2	16.5	09.5	16.3	09.8	16.3	09.8	19
20	17.7	09.4	17.6	09.4	17.5	09.7	17.3	10.0	17.2	10.3	17.1	10.3	20
21	18.5	09.9	18.5	09.9	18.4	10.2	18.2	10.5	18.0	10.8	18.0	10.8	21
22	19.4	10.3	19.4	10.4	19.2	10.7	19.1	11.0	18.9	11.3	18.9	11.3	22
23	20.3	10.8	20.3	10.8	20.1	11.1	19.9	11.5	19.7	11.8	19.7	11.8	23
24	21.2	11.3	21.2	11.3	21.0	11.6	20.8	12.0	20.6	12.3	20.6	12.3	24
25	22.1	11.7	22.0	11.8	21.9	12.1	21.6	12.5	21.4	12.9	21.4	12.9	25
26	23.0	12.2	22.9	12.3	22.7	12.6	22.5	13.0	22.3	13.4	22.3	13.4	26
27	23.8	12.7	23.8	12.7	23.6	13.1	23.4	13.5	23.2	13.9	23.1	13.9	27
28	24.7	13.1	24.7	13.2	24.5	13.6	24.2	14.0	24.0	14.4	24.0	14.4	28
29	25.6	13.6	25.6	13.7	25.4	14.1	25.1	14.5	24.9	14.9	24.9	14.9	29
30	26.5	14.1	26.5	14.1	26.2	14.5	26.0	15.0	25.7	15.4	25.7	15.4	30
31	27.4	14.6	27.3	14.6	27.1	15.0	26.8	15.5	26.6	15.9	26.6	16.0	31
32	28.3	15.0	28.2	15.1	28.0	15.5	27.7	16.0	27.4	16.4	27.4	16.5	32
33	29.1	15.5	29.1	15.6	28.9	16.0	28.6	16.5	28.3	17.0	28.3	17.0	33
34	30.0	16.0	30.0	16.0	29.7	16.5	29.4	17.0	29.2	17.5	29.1	17.5	34
35	30.9	16.4	30.9	16.5	30.6	17.0	30.3	17.5	30.0	18.0	30.0	18.0	35
36	31.8	16.9	31.7	17.0	31.5	17.5	31.2	18.0	30.9	18.5	30.9	18.5	36
37	32.7	17.4	32.6	17.4	32.4	17.9	32.0	18.5	31.7	19.0	31.7	19.1	37
38	33.5	17.8	33.5	17.9	33.2	18.4	32.9	19.0	32.6	19.5	32.6	19.6	38
39	34.4	18.3	34.4	18.4	34.1	18.9	33.8	19.5	33.4	20.0	33.4	20.1	39
40	35.3	18.8	35.3	18.9	35.0	19.4	34.6	20.0	34.3	20.6	34.3	20.6	40
41	36.2	19.2	36.2	19.3	35.9	19.9	35.5	20.5	35.2	21.1	35.1	21.1	41
42	37.1	19.7	37.0	19.8	36.7	20.4	36.4	21.0	36.0	21.6	36.0	21.6	42
43	38.0	20.2	37.9	20.3	37.6	20.8	37.2	21.5	36.9	22.1	36.9	22.1	43
44	38.8	20.7	38.8	20.7	38.5	21.3	38.1	22.0	37.7	22.6	37.7	12.7	44
45	39.7	21.1	39.7	21.2	39.4	21.8	39.0	22.5	38.6	23.1	38.6	23.2	45
46	40.6	21.6	40.6	21.7	40.2	22.3	39.8	23.0	39.5	23.6	39.4	23.7	46
47	41.5	22.1	41.4	22.2	41.1	22.8	40.7	23.5	40.3	24.2	40.3	24.2	47
48	42.4	22.5	42.3	22.6	42.0	23.3	41.6	24.0	41.2	24.7	41.1	24.7	48
49	43.3	23.0	43.2	23.1	42.9	23.8	42.4	24.5	42.0	25.2	42.0	25.2	49
50	44.1	23.5	44.1	23.6	43.7	24.2	43.3	25.0	42.9	25.7	42.9	25.7	50
Dist	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist
	62 Deg.		5½ Poiot		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

Dist.	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¾ Point		31 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	45.0	23.9	45.0	24.0	44.6	24.7	44.2	25.5	43.7	26.2	43.7	26.3	51
52	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44.6	26.7	44.6	26.8	52
53	46.8	24.9	46.7	25.0	46.4	25.7	45.9	26.5	45.5	27.2	45.4	27.3	53
54	47.7	25.4	47.6	25.5	47.2	26.2	46.8	27.0	46.3	27.8	46.3	27.8	54
55	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.[illegible]	28.3	47.1	28.3	55
56	49.4	26.3	49.4	26.4	49.0	27.1	48.5	28.0	48.0	28.8	48.0	28.8	56
57	50.3	26.8	50.3	26.9	49.9	27.6	49.4	28.5	48.9	29.3	48.9	29.4	57
58	51.2	27.2	51.2	27.3	50.7	28.1	50.2	29.0	49.7	29.8	49.7	29.9	58
59	52.1	27.7	52.0	27.8	51.6	28.6	51.1	29.5	50.6	30.3	50.6	30.4	59
60	53.0	28.2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.9	60
61	53.9	28.6	53.8	28.8	53.3	29.6	52.8	30.5	52.3	31.4	52.3	31.4	61
62	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31.9	62
63	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	63
64	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	64
65	57.4	30.5	57.3	30.6	56.8	31.5	56.3	32.5	55.7	33.4	55.7	33.5	65
66	58.3	31.0	58.2	31.1	57.7	32.0	57.2	33.0	56.6	33.9	56.6	34.0	66
67	59.2	31.5	59.1	31.6	58.6	32.5	58.0	33.5	57.5	34.4	57.4	34.5	67
68	60.0	31.9	60.0	32.1	59.5	33.0	58.9	34.0	58.3	35.0	58.3	35.0	68
69	60.9	32.4	60.9	32.5	60.3	33.5	59.8	34.5	59.2	35.5	59.1	35.5	69
70	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	60.0	36.0	60.0	36.0	70
71	62.7	33.3	62.6	33.5	62.1	34.4	61.5	35.5	60.9	36.5	60.9	36.6	71
72	63.6	33.8	63.5	33.9	63.0	34.9	62.4	36.0	61.8	37.0	61.7	37.1	72
73	64.5	34.3	64.4	34.4	63.8	35.4	63.2	36.5	62.6	37.5	62.6	37.6	73
74	65.3	34.7	65.3	34.9	64.7	35.9	64.1	37.0	63.5	38.0	63.4	38.1	74
75	66.2	35.2	66.1	35.4	65.6	36.4	64.9	37.5	64.3	38.6	64.3	38.6	75
76	67.1	35.7	67.0	35.8	66.5	36.8	65.8	38.0	65.2	39.1	65.1	39.1	76
77	68.0	36.2	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	77
78	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	66.9	40.1	66.9	40.2	78
79	69.7	37.1	69.7	37.2	69.1	38.3	68.4	39.5	67.8	40.6	67.7	40.7	79
80	70.6	37.6	70.6	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	80
81	71.5	38.0	71.4	38.2	70.8	39.3	70.1	40.5	69.5	41.6	69.4	41.7	81
82	72.4	38.5	72.3	38.7	71.7	39.8	71.0	41.0	70.3	42.2	70.3	42.2	82
83	73.3	39.0	73.2	39.1	72.6	40.2	71.9	41.5	71.2	42.7	71.1	42.7	83
84	74.2	39.4	74.1	39.6	73.5	40.7	72.7	42.0	72.0	43.2	72.0	43.3	84
85	75.0	39.9	75.0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43.8	85
86	75.9	40.4	75.8	40.5	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.3	86
87	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	87
88	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	88
89	78.6	41.8	78.5	42.0	77.8	43.1	77.1	44.5	76.3	45.8	76.3	45.8	89
90	79.5	42.3	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	46.3	90
91	80.3	42.7	80.3	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	91
92	81.2	43.2	81.1	43.4	80.5	44.6	79.7	46.0	78.9	47.3	78.9	47.4	92
93	82.1	43.7	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47.9	93
94	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	94
95	83.9	44.6	83.8	44.8	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	95
96	84.8	45.1	84.7	45.3	84.0	46.5	83.1	48.0	82.3	49.4	82.3	49.4	96
97	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	97
98	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	98
99	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	99
100	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	62 Deg.		5½ Points		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

A Table of DIFFERENCE

Dist.	32 Deg.		33 Deg.		3 Point		34 Deg.		35 Deg.		36 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.5	00.8	00.5	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.7	01.1	01.7	01.1	01.7	01.1	01.6	01.1	01.6	01.1	01.6	01.2	2
3	02.5	01.6	02.5	01.6	02.5	01.7	02.5	01.7	02.5	01.7	02.4	01.8	3
4	03.4	02.1	03.4	02.2	03.3	02.2	03.3	02.2	03.3	02.3	03.2	02.4	4
5	04.2	02.6	04.2	02.7	04.2	02.8	04.1	02.8	04.1	02.9	04.0	02.9	5
6	05.1	03.2	05.0	03.3	05.0	03.3	05.0	03.3	04.9	03.4	04.9	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05.8	03.9	05.7	04.0	05.7	04.1	7
8	06.8	04.2	06.7	04.4	06.6	04.4	06.6	04.5	06.6	04.6	06.5	04.7	8
9	07.6	04.8	07.5	04.9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05.3	9
10	08.5	05.3	08.4	05.4	08.3	05.6	08.3	05.6	08.2	05.7	08.1	05.9	10
11	09.3	05.8	09.2	06.0	09.1	06.1	09.1	06.2	09.0	06.3	08.9	06.5	11
12	10.2	06.4	10.1	06.5	10.0	06.7	09.9	06.7	09.8	06.9	09.7	07.0	12
13	11.0	06.9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11.9	07.4	11.7	07.6	11.6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07.9	12.6	08.2	12.5	08.3	12.4	08.3	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13.4	08.7	13.3	08.9	13.3	08.9	13.1	09.2	12.9	09.4	16
17	14.4	09.0	14.3	09.3	14.1	09.4	14.1	09.5	13.9	09.8	13.8	10.0	17
18	15.3	09.5	15.1	09.8	15.0	10.0	14.9	10.1	14.7	10.3	14.6	10.6	18
19	16.1	10.1	15.9	10.3	15.8	10.6	15.8	10.6	15.6	10.9	15.4	11.2	19
20	17.0	10.6	16.8	10.9	16.6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.7	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12.5	19.1	12.8	19.1	12.9	18.8	13.2	18.6	13.5	23
24	20.4	12.7	20.1	13.1	20.0	13.3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.8	13.9	20.7	14.0	20.5	14.3	20.2	14.7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.6	14.5	21.3	14.9	21.0	15.3	26
27	22.9	14.3	22.6	14.7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23.7	14.8	23.5	15.2	23.3	15.6	23.2	15.7	22.9	16.1	22.7	16.5	28
29	24.6	15.4	24.3	15.8	24.1	16.1	24.0	16.2	23.8	16.6	23.5	17.0	29
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24.6	17.2	24.3	17.6	30
31	26.3	16.4	26.0	16.9	25.8	17.2	25.7	17.3	25.4	17.8	25.1	18.2	31
32	27.1	17.0	26.8	17.4	26.6	17.8	26.5	17.9	26.2	18.4	25.9	18.8	32
33	28.0	17.5	27.7	18.0	27.4	18.3	27.4	18.5	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28.3	18.9	28.2	19.0	27.9	19.5	27.5	20.0	34
35	29.7	18.5	29.4	19.1	29.1	19.4	29.0	19.6	28.7	20.1	28.3	20.6	35
36	30.5	19.1	30.2	19.6	29.9	20.0	29.8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20.1	30.8	20.6	30.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	20.7	31.6	21.1	31.5	21.2	31.1	21.8	30.7	22.3	38
39	33.1	20.7	32.7	21.2	32.4	21.7	32.3	21.8	32.0	22.4	31.6	22.9	39
40	33.9	21.2	33.6	21.8	33.3	22.2	33.2	22.4	32.8	22.9	32.4	23.5	40
41	34.8	21.7	34.4	22.3	34.1	22.8	34.0	22.9	33.6	23.5	33.2	24.1	41
42	35.6	22.3	35.2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34.0	24.7	42
43	36.5	22.8	36.1	23.4	35.8	23.9	35.6	24.0	35.2	24.7	34.8	25.3	43
44	37.3	23.3	36.9	24.0	36.6	24.4	36.5	24.6	36.0	25.2	35.6	25.9	44
45	38.2	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36.4	26.5	45
46	39.0	24.4	38.6	25.1	38.2	25.6	38.1	25.7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26.1	39.0	26.3	38.5	27.0	38.0	27.6	47
48	40.7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.5	38.8	28.2	48
49	41.6	26.0	41.1	26.7	40.7	27.2	40.6	27.4	40.1	28.1	39.6	28.8	49
50	42.4	26.5	41.9	27.2	41.6	27.8	41.4	28.0	41.0	28.7	40.4	29.4	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	58 Deg.		57 Deg.		5 Point		56 Deg.		55 Deg.		54 Deg.		

Dist.	32 Deg.		33 Deg.		3 Point		34 Deg.		35 Deg.		36 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	43.2	27.0	42.8	27.8	42.4	28.3	42.3	28.5	41.8	29.3	41.3	30.0	51
52	44.1	27.6	43.6	28.3	43.2	28.9	43.1	29.1	42.6	29.8	42.1	30.6	52
53	44.9	28.1	44.5	28.9	44.1	29.4	43.9	29.6	43.4	30.4	42.9	31.2	53
54	45.8	28.6	45.3	29.4	44.9	30.0	44.8	30.2	44.2	31.0	43.7	31.7	54
55	46.6	29.1	46.1	30.0	45.7	30.6	45.6	30.8	45.1	31.5	44.5	32.3	55
56	47.5	29.7	47.0	30.5	46.6	31.1	46.4	31.3	45.9	32.1	45.3	32.9	56
57	48.3	30.2	47.8	31.0	47.4	31.7	47.3	31.9	46.7	32.7	46.1	33.5	57
58	49.2	30.7	48.6	31.6	48.2	32.2	48.1	32.4	47.5	33.3	46.9	34.1	58
59	50.0	31.3	49.5	32.1	49.1	32.8	48.9	33.0	48.3	33.8	47.7	34.7	59
60	50.9	31.8	50.3	32.7	49.9	33.3	49.7	33.6	49.2	34.4	48.5	35.3	60
61	51.7	32.3	51.2	33.2	50.7	33.9	50.6	34.1	50.0	35.0	49.3	35.9	61
62	52.6	32.8	52.0	33.8	51.6	34.4	51.4	34.7	50.8	35.6	50.2	36.4	62
63	53.4	33.4	52.8	34.3	52.4	35.0	52.2	35.2	51.6	36.1	51.0	37.0	63
64	54.3	33.9	53.7	34.9	53.2	35.6	53.1	35.8	52.4	36.7	51.8	37.6	64
65	55.1	34.4	54.5	35.4	54.0	36.1	53.9	36.3	53.2	37.3	52.6	38.2	65
66	56.0	35.0	55.4	35.9	54.9	36.7	54.7	36.9	54.1	37.9	53.4	38.8	66
67	56.8	35.5	56.2	36.5	55.7	37.2	55.5	37.5	54.9	38.4	54.2	39.4	67
68	57.7	36.0	57.0	37.0	56.5	37.8	56.4	38.0	55.7	39.0	55.0	40.0	68
69	58.5	36.6	57.9	37.6	57.4	38.3	57.2	38.6	56.5	39.6	55.8	40.6	69
70	59.4	37.1	58.7	38.1	58.2	38.9	58.0	39.1	57.3	40.2	56.6	41.1	70
71	60.2	37.6	59.5	38.7	59.0	39.4	58.9	39.7	58.2	40.7	57.4	41.7	71
72	61.1	38.2	60.4	39.2	59.9	40.0	59.7	40.3	59.0	41.3	58.2	42.3	72
73	61.9	38.7	61.2	39.8	60.7	40.6	60.5	40.8	59.8	41.9	59.1	42.9	73
74	62.8	39.2	62.1	40.3	61.5	41.1	61.3	41.4	60.6	42.4	59.9	43.5	74
75	63.6	39.7	62.9	40.8	62.4	41.7	62.2	41.9	61.4	43.0	60.7	44.1	75
76	64.4	40.3	63.7	41.4	63.2	42.2	63.0	42.5	62.3	43.6	61.5	44.7	76
77	65.3	40.8	64.6	41.9	64.0	42.8	63.8	43.1	63.1	44.2	62.3	45.3	77
78	66.1	41.3	65.4	42.5	64.9	43.3	64.7	43.6	63.9	44.7	63.1	45.8	78
79	67.0	41.9	66.3	43.0	65.7	43.9	65.5	44.2	64.7	45.3	63.9	46.4	79
80	67.8	42.4	67.1	43.6	66.5	44.4	66.3	44.7	65.5	45.9	64.7	47.0	80
81	68.7	42.9	67.9	44.1	67.4	45.0	67.1	45.3	66.4	46.5	65.5	47.6	81
82	69.5	43.4	68.8	44.7	68.2	45.6	68.0	45.9	67.2	47.0	66.3	48.2	82
83	70.4	44.0	69.6	45.2	69.0	46.1	68.8	46.4	68.0	47.6	67.1	48.8	83
84	71.2	44.5	70.5	45.7	69.8	46.7	69.6	47.0	68.8	48.2	68.0	49.4	84
85	72.1	45.0	71.3	46.3	70.7	47.2	70.5	47.5	69.6	48.8	68.8	50.0	85
86	72.9	45.6	72.1	46.8	71.5	47.8	71.3	48.1	70.5	49.3	69.6	50 5	86
87	73.8	46.1	73.0	47.4	72.3	48.3	72.1	48.6	71.3	49.9	70.4	51.1	87
88	74.6	46.6	73.8	47.9	73.2	48.9	73.0	49.2	72.1	50.5	71.2	51.7	88
89	75.5	47.2	74.6	48.5	74.0	49.4	73.8	49.8	72.9	50.0	72.0	52.3	89
90	76.3	47.7	75.5	49.0	74.8	50.0	74.6	50.3	73.7	51.6	72.8	52.9	90
91	77.2	48.2	76.3	49.6	75.7	50.6	75.4	50.9	74.5	52.2	73.6	53.5	91
92	78.0	48.7	77.2	50.1	76.5	51.1	76.3	51.4	75.4	52.8	74.4	54.1	92
93	78.9	49.3	78.0	50.6	77.3	51.7	77.1	52.0	76.2	53.3	75 2	54.7	93
94	79.7	49.8	78.8	51.2	78.2	52.2	77.9	52.6	77.0	53.9	76.0	55.3	94
95	80.6	50.3	79.7	51.7	79.0	52.8	78.8	53.1	77.8	54.5	76.9	55.8	95
96	81.4	50.9	80.5	52.3	79.8	53.3	79.6	53.7	78.6	55.1	77.7	56.4	96
97	82.3	51.4	81.4	52.8	80.7	53.9	80.4	54.2	79.5	55.6	78.5	57.0	97
98	83.1	51.9	82.2	53.4	81.5	54.4	81.2	54.8	80.3	56.2	79.3	57.6	98
99	84.0	52.5	83.0	53.9	82.3	55.0	82.1	55.4	81.1	56.8	80.1	58.2	99
100	84.8	53.0	83.9	54.5	83.1	55.6	82.9	55.9	81.9	57.4	80.9	58.8	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	58 Deg.		57 Deg.		5 Point		56 Deg.		55 Deg.		54 Deg.		

Dist.	3¼ Points		37 Deg.		38 Deg.		39 Deg.		3½ Points		40 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.6	01.2	01.6	01.2	01.6	01.2	01.6	01.3	01.5	01.3	01.5	01.3	2
3	02.4	01.8	02.4	01.8	02.4	01.8	02.3	01.9	02.3	01.9	02.3	01.9	3
4	03.2	02.4	03.2	02.4	03.2	02.5	03.1	02.5	03.1	02.5	03.1	02.6	4
5	04.0	03.0	04.0	03.0	03.9	03.1	03.9	03.1	03.9	03,2	03.8	03.2	5
6	04.8	03.6	04.8	03.6	04.7	03.7	04.7	03.8	04.6	03.8	04.6	03.9	6
7	05.6	04.2	05.6	04.2	05.5	04.3	05.4	04.4	05.4	04.4	05.4	04.5	7
8	06.4	04.8	06.4	04.8	06.3	04.9	06.2	05.0	06.2	05.1	06.1	05.1	8
9	07.2	05.4	07.2	05.4	07.1	05.5	07.0	05.7	07.0	05.7	06.9	05.8	9
10	08.0	06.0	08.0	06.0	07.9	06.2	07.8	06.3	07.7	06.3	07.7	06.4	10
11	08.8	06.6	08.8	06.6	08.7	06.8	08.5	06.9	08.5	07.0	08.4	07.1	11
12	09.6	07.1	09.6	07.2	09.5	07.4	09.3	07.6	09.3	07.6	09.2	07.7	12
13	10.4	07.7	10.4	07.8	10.2	08.0	10.1	08.2	10.0	08.2	10.0	08.4	13
14	11.2	08.3	11.2	08.4	11.0	08.6	10.9	08.8	10.8	08.9	10.7	09.0	14
15	12.0	08.9	12.0	09.0	11.8	09.2	11.7	09.4	11.6	09.5	11.5	09.6	15
16	12.9	09.5	12.8	09.6	12.0	09.9	12.4	10.1	12.4	10.1	12.3	10.3	16
17	13.7	10.1	13.6	10.2	13.4	10.5	13.2	10.7	13.1	10.8	13.0	10.9	17
18	14.5	10.7	14.4	10.8	14.2	11.1	14.0	11.3	13.9	11.4	13.8	11.6	18
19	15.3	11.3	15.2	11.4	15.0	11.7	14.8	12.0	14.7	12.1	14.6	12.2	19
20	16.1	11.9	16.0	12.0	15.8	12.3	15.5	12.6	15.5	12.7	15.3	12.9	20
21	16.9	12.5	16.8	12 6	16.5	12.9	16.3	13.2	16.2	13.3	16.1	13.5	21
22	17.7	13.1	17.6	13.2	17.3	13.5	17.1	13.8	17.0	14.0	16.9	14.1	22
23	18.5	13.7	18.4	13.8	18.1	14.2	17.9	14.5	17.8	14.6	17.6	14.8	23
24	19.3	14.3	19.2	14.4	18.9	14.8	18.6	15.1	18.6	15.2	18.4	15.4	24
25	20.1	14.9	20.0	15.0	19.7	15.4	19.4	15.7	19.3	15.9	19.1	16.1	25
26	20.9	15.5	20.8	15.6	20.5	16.0	20.2	16.4	20.1	16.5	19.9	16.7	26
27	21.7	16.1	21.6	16.2	21.3	16.6	21.0	17.0	20.9	17.1	20.7	17.4	27
28	22.5	16.7	22.4	16.8	22.1	17.2	21.8	17.6	21.6	17.8	21.4	18.0	28
29	23.3	17.3	23.2	17.5	22.9	17.9	22.5	18.2	22.4	18.4	22.2	18.6	29
30	24.1	17.9	24.0	18.1	23.6	18.5	23.3	18.9	23.2	19.0	23.0	19.3	30
31	24.9	18.5	24.8	18.7	24.4	19.1	24.1	19.5	24.0	19.7	23.7	19.9	31
32	25.7	19.1	25.6	19.3	25.2	19.7	24.9	20.1	24.7	20.3	24.5	20.6	32
33	26.5	19.7	26.4	19.9	26.0	20.3	25.6	20.8	25.5	20.9	25.3	21.2	33
34	27.3	20.3	27.2	20.5	26.8	20.9	26.4	21.4	26.3	21.6	26.0	21.9	34
35	28.1	20.8	28.0	21.1	27.6	21.5	27.2	22.0	27.1	22.2	26.8	22.5	35
36	28.9	21.4	28.7	21.7	28.4	22.2	28.0	22.7	27.8	22.8	27.6	23.1	36
37	29.7	22.0	29.5	22.3	29.2	22.8	28.8	23.3	28.6	23.5	28.3	23.8	37
38	30.5	22.6	30.3	22.9	29.9	23.4	29.5	23.9	29.4	24.1	29.1	24.4	38
39	31.3	23.2	31.1	23.5	30.7	24.0	30.3	24.5	30.1	24.7	29.9	25.1	39
40	32.1	23.8	31.9	24.1	31.5	24.6	31.1	25.2	30.9	25.4	30.6	25.7	40
41	32.9	24.4	32.7	24.7	32.3	25.2	31.9	25.8	31.7	26.0	31.4	26.4	41
42	33.7	25.0	33.5	25.3	33.1	25.9	32.6	26.4	32.5	26.6	32.2	27.0	42
43	34.5	25.6	34.3	25.9	33.9	26.5	33.4	27.1	33.2	27.3	32.9	27.6	43
44	35.3	26.2	35.1	26.5	34.7	27.1	34.2	27.7	34.0	27.9	33.7	28.3	44
45	36.1	26.8	35.9	27.1	35.5	27.7	35.0	28.3	34.8	28.5	34.5	28.9	45
46	36.9	27.4	36.7	27.7	36.2	28.3	35.7	28.9	35.6	29.2	35.2	29.6	46
47	37.7	28.0	37.5	28.3	37.0	28.9	36.5	29.6	36.3	29.8	36.0	30.2	47
48	38.5	28.6	38.3	28.9	37.8	29.6	37.3	30.2	37.1	30.5	36.8	30.9	48
49	39.4	29.2	39.1	29.5	38.6	30.2	38.1	30.8	37.9	31.1	37.5	31.5	49
50	40.2	29.8	39.9	30.1	39.4	30.8	38.9	31.5	38.6	31.7	38.3	32.1	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	4¾ Points		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		

Dist.	3¼ Point		37 Deg.		38 Deg.		39 Deg.		3½ Point		40 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	41.0	30.4	40.7	30.7	40.2	31.4	39.6	32.1	39.4	32.4	39.1	32.8	51
52	41.8	31.0	41.5	31.3	41.0	32.0	40.4	32.7	40.2	33.0	39.8	33.4	52
53	42.6	31.6	42.3	31.9	41.8	32.6	41.2	33.4	41.0	33.6	40.6	34.1	53
54	43.4	32.2	43.1	32.5	42.6	33.2	42.0	34.0	41.7	34.3	41.4	34.7	54
55	44.2	32.8	43.9	33.1	43.3	33.9	42.7	34.6	42.5	34.9	42.1	35.4	55
56	45.0	33.4	44.7	33.7	44.1	34.5	43.5	35.2	43.3	35.5	42.9	36.0	56
57	45.8	34.0	45.5	34.3	44.9	35.1	44.3	35.9	44.1	36.2	43.7	36.6	57
58	46.6	34.5	46.3	34.9	45.7	35.7	45.1	36.5	44.8	36.8	44.4	37.3	58
59	47.4	35.1	47.1	35.5	46.5	36.3	45.8	37.1	45.6	37.4	45.2	37.9	59
60	48.2	35.7	47.9	36.1	47.3	36.9	46.6	37.8	46.4	38.1	46.0	38.6	60
61	49.0	36.3	48.7	36.7	48.1	37.6	47.4	38.4	47.2	38.7	46.7	39.2	61
62	49.8	36.9	49.5	37.3	48.9	38.2	48.2	39.0	47.9	39.3	47.5	39.9	62
63	50.6	37.5	50.3	37.9	49.6	38.8	49.0	39.6	48.7	40.0	48.3	40.5	63
64	51.4	38.1	51.1	38.5	50.4	39.4	49.7	40.3	49.5	40.6	49.0	41.1	64
65	52.2	38.7	51.9	39.1	51.2	40.0	50.5	40.9	50.2	41.2	49.8	41.8	65
66	53.0	39.3	52.7	39.7	52.0	40.6	51.3	41.5	51.0	41.9	50.6	42.4	66
67	53.8	39.9	53.5	40.3	52.8	41.3	52.1	42.2	51.8	42.5	51.3	43.1	67
68	54.6	40.5	54.3	40.9	53.6	41.9	52.8	42.8	52.6	43.1	52.1	43.7	68
69	55.4	41.1	55.1	41.5	54.4	42.5	53.6	43.4	53.3	43.8	52.9	44.4	69
70	56.2	41.7	55.9	42.1	55.2	43.1	54.4	44.1	54.1	44.4	53.6	45.0	70
71	57.0	42.3	56.7	42.7	55.9	43.7	55.2	44.7	54.9	45.0	54.4	45.6	71
72	57.8	42.9	57.5	43.3	56.7	44.3	56.0	45.3	55.7	45.7	55.2	46.3	72
73	58.6	43.5	58.3	43.9	57.5	44.9	56.7	45.9	56.4	46.3	55.9	46.9	73
74	59.4	44.1	59.1	44.5	58.3	45.6	57.5	46.6	57.2	46.9	56.7	47.6	74
75	60.2	44.7	59.9	45.1	59.1	46.2	58.3	47.2	58.0	47.6	57.5	48.2	75
76	61.0	45.3	60.7	45.7	59.9	46.8	59.1	47.8	58.7	48.2	58.2	48.9	76
77	61.8	45.9	61.5	46.3	60.7	47.4	59.8	48.5	59.5	48.8	59.0	49.5	77
78	62.6	46.5	62.3	46.9	61.5	48.0	60.6	49.1	60.3	49.5	59.7	50.1	78
79	63.5	47.1	63.1	47.5	62.3	48.6	61.4	49.7	61.1	50.1	60.5	50.8	79
80	64.3	47.7	63.9	48.1	63.0	49.3	62.2	50.3	61.8	50.8	61.3	51.4	80
81	65.1	48.3	64.7	48.7	63.8	49.9	62.9	51.0	62.6	51.4	62.0	52.1	81
82	65.9	48.8	65.5	49.3	64.6	50.5	63.7	51.6	63.4	52.0	62.8	52.7	82
83	66.7	49.4	66.3	49.9	65.4	51.1	64.5	52.2	64.2	52.7	63.6	53.4	83
84	67.5	50.0	67.1	50.6	66.2	51.7	65.3	52.9	64.9	53.3	64.3	54.0	84
85	68.3	50.6	67.9	51.2	67.0	52.3	66.1	53.5	65.7	53.9	65.1	54.6	85
86	69.1	51.2	68.7	51.8	67.8	52.9	66.8	54.1	66.5	54.6	65.9	55.3	86
87	69.9	51.8	69.5	52.4	68.6	53.6	67.6	54.7	67.3	55.2	66.6	55.9	87
88	70.7	52.4	70.3	53.0	69.3	54.2	68.4	55.4	68.0	55.8	67.4	56.6	88
89	71.5	53.0	71.1	53.6	70.1	54.8	69.2	56.0	68.8	56.5	68.2	57.2	89
90	72.3	53.6	71.9	54.2	70.9	55.4	69.9	56.6	69.6	57.1	68.9	57.9	90
91	73.1	54.2	72.7	54.8	71.7	56.0	70.7	57.3	70.3	57.7	69.7	58.5	91
92	73.9	54.8	73.5	55.4	72.5	56.6	71.5	57.9	71.1	58.4	70.5	59.1	92
93	74.7	55.4	74.3	56.0	73.3	57.3	72.3	58.5	71.9	59.0	71.2	59.8	93
94	75.5	56.0	75.1	56.6	74.1	57.9	73.0	59.2	72.7	59.6	72.0	60.4	94
95	76.3	56.6	75.9	57.2	74.9	58.5	73.8	59.8	73.4	60.3	72.8	61.1	95
96	77.1	57.2	76.7	57.8	75.6	59.1	74.6	60.4	74.2	60.9	73.5	61.7	96
97	77.9	57.8	77.5	58.4	76.4	59.7	75.4	61.0	75.0	61.5	74.3	62.4	97
98	78.7	58.4	78.3	59.0	77.2	60.3	76.2	61.7	75.8	62.2	75.1	63.0	98
99	79.5	59.0	79.1	59.6	78.0	61.0	76.9	62.3	76.5	62.8	75.8	63.6	99
100	80.3	59.6	79.9	60.2	78.8	61.6	77.7	62.9	77.3	63.4	76.6	64.3	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	4¾ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		Dist.

Diff.	41 Deg.		42 Deg.		3 ¾ Point		43 Deg.		44 Deg.		4 Points		Diff.
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	
1	00.8	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	1
2	01.5	01.3	01.5	01.3	01.5	01.3	01.5	01.4	01.4	01.4	01.4	01.4	2
3	02.3	02.0	02.2	02.0	02.2	02.0	02.2	02.0	02.2	02.1	02.1	02.1	3
4	03.0	02.6	03.0	02.7	03.0	02.7	03.0	02.7	02.9	02.8	02.8	02.8	4
5	03.8	03.3	03.7	03.3	03.7	03.4	03.7	03.4	03.6	03.5	03.5	03.5	5
6	04.5	03.9	04.5	04.0	04.4	04.0	04.4	04.1	04.3	04.2	04.2	04.2	6
7	05.3	04.6	05.2	04.7	05.2	04.7	05.1	04.8	05.0	04.9	04.9	04.9	7
8	06.0	05.2	05.9	05.4	05.9	05.4	05.9	05.5	05.8	05.6	05.7	05.7	8
9	06.8	05.9	06.7	05.0	06.7	06.0	06.6	06.1	06.5	06.3	06.4	06.4	9
10	07.5	06.6	07.4	06.7	07.4	06.7	07.3	06.8	07.2	06.9	07.1	07.1	10
11	08.3	07.2	08.2	07.4	08.2	07.4	08.0	07.5	07.9	07.6	07.8	07.8	11
12	09.1	07.9	08.9	08.0	08.9	08.1	08.8	08.2	08.6	08.3	08.5	08.5	12
13	09.8	08.5	09.7	08.7	09.6	08.7	09.5	08.9	09.3	09.0	09.2	09.2	13
14	10.6	09.2	10.4	09.4	10.4	09.4	10.2	09.5	10.1	09.7	09.9	09.9	14
15	11.3	09.8	11.1	10.0	11.1	10.1	11.0	10.2	10.8	10.4	10.6	10.6	15
16	12.1	10.5	11.9	10.7	11.9	10.7	11.7	10.9	11.5	11.1	11.3	11.3	16
17	12.8	11.2	12.6	11.4	12.6	11.4	12.4	11.6	12.2	11.8	12.0	12.0	17
18	13.6	11.8	13.4	12.0	13.3	12.1	13.2	12.3	12.9	12.5	12.7	12.7	18
19	14.3	12.5	14.1	12.7	14.1	12.8	13.9	13.0	13.7	13.2	13.4	13.4	19
20	15.1	13.1	14.9	13.4	14.8	13.4	14.6	13.6	14.4	13.9	14.1	14.1	20
21	15.8	13.8	15.6	14.0	15.6	14.1	15.4	14.3	15.1	14.6	14.8	14.8	21
22	16.6	14.4	16.3	14.7	16.3	14.8	16.1	15.0	15.8	15.3	15.6	15.6	22
23	17.4	15.1	17.1	15.4	17.0	15.4	16.8	15.7	16.5	16.0	16.3	16.3	23
24	18.1	15.7	17.8	16.1	17.8	16.1	17.6	16.4	17.3	16.7	17.0	17.0	24
25	18.9	16.4	18.6	16.7	18.5	16.8	18.3	17.1	18.0	17.4	17.7	17.7	25
26	19.6	17.1	19.3	17.4	19.3	17.5	19.0	17.7	18.7	18.1	18.4	18.4	26
27	20.4	17.7	20.1	18.1	20.0	18.1	19.7	18.4	19.4	18.8	19.1	19.1	27
28	21.1	18.4	20.8	18.7	20.7	18.8	20.5	19.1	20.1	19.5	19.8	19.8	28
29	21.9	19.0	21.5	19.4	21.5	19.5	21.2	19.8	20.9	20.1	20.5	20.5	29
30	22.6	19.7	22.3	20.1	22.2	20.1	21.9	20.5	21.6	20.8	21.2	21.2	30
31	23.4	20.3	23.0	20.7	23.0	20.8	22.7	21.1	22.3	21.5	21.9	21.9	31
32	24.1	21.0	23.8	21.4	23.7	21.5	23.4	21.8	23.0	22.2	22.6	22.6	32
33	24.9	21.7	24.5	22.1	24.5	22.2	24.1	22.5	23.7	22.9	23.3	23.3	33
34	25.7	22.3	25.3	22.7	25.2	22.8	24.9	23.2	24.5	23.6	24.0	24.0	34
35	26.4	23.0	26.0	23.4	25.9	23.5	25.6	23.9	25.2	24.3	24.7	24.7	35
36	27.2	23.6	26.8	24.1	26.7	24.2	26.3	24.6	25.9	25.0	25.5	25.5	36
37	27.9	24.3	27.5	24.8	27.4	24.8	27.0	25.2	26.6	25.7	26.2	26.2	37
38	28.7	24.9	28.2	25.4	28.2	25.5	27.8	25.9	27.3	26.4	26.9	26.9	38
39	29.4	25.6	29.0	26.1	28.9	26.2	28.5	26.6	28.1	27.1	27.6	27.6	39
40	30.2	26.2	29.7	26.8	29.6	26.9	29.3	27.3	28.8	27.8	28.3	28.3	40
41	30.9	26.9	30.5	27.4	30.4	27.5	30.0	28.0	29.5	28.5	29.0	29.0	41
42	31.7	27.6	31.2	28.1	31.1	28.2	30.7	28.6	30.2	29.2	29.7	29.7	42
43	32.5	28.2	32.0	28.8	31.8	28.9	31.4	29.3	30.9	29.9	30.4	30.4	43
44	33.2	28.9	32.7	29.4	32.6	29.5	32.2	30.0	31.6	30.6	31.1	31.1	44
45	34.0	29.5	33.4	30.1	33.3	30.2	32.9	30.7	32.4	31.3	31.8	31.8	45
46	34.7	30.2	34.2	30.8	34.1	30.9	33.6	31.4	33.1	32.0	32.5	32.5	46
47	35.5	30.8	34.9	31.4	34.8	31.6	34.4	32.1	33.8	32.6	33.2	33.2	47
48	36.2	31.5	35.7	32.1	35.6	32.2	35.1	32.7	34.5	33.3	33.9	33.9	48
49	37.0	32.1	36.4	32.8	36.3	32.9	35.8	33.4	35.2	34.0	34.6	34.6	49
50	37.7	32.8	37.2	33.5	37.0	33.6	36.6	34.1	36.0	34.7	35.4	35.4	50
Diff.	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	Diff.
	49 Deg.		48 Deg.		4 ¼ Point		47 Deg.		46 Deg.		4 Points		

Dist.	41 Deg.		42 Deg.		3¾ Point		43 Deg.		44 Deg.		4 Points		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	38.5	33.5	37.9	34.1	37.8	34.3	37.3	34.8	36.7	35.4	36.1	36.1	51
52	39.2	34.1	38.6	34.8	38.5	34.9	38.0	35.5	37.4	36.1	36.8	36.8	52
53	40.0	34.8	39.4	35.5	39.3	35.6	38.8	36.1	38.1	36.8	37.5	37.5	53
54	40.8	35.4	40.1	36.1	40.0	36.3	39.5	35.8	38.8	37.5	38.2	38.2	54
55	41.5	36.1	40.9	36.8	40.8	36.9	40.2	37.5	39.6	38.2	38.9	38.9	55
56	42 3	36.7	41.6	37.5	41.5	37.6	41.0	38.2	40.3	38.9	39.6	39.6	56
57	43.0	37.4	42.4	38.1	42.2	38.3	41.7	38.9	41.0	39.6	40.3	40.3	57
58	43.8	38.1	43.1	38.8	43.0	39.0	42.4	39.6	41 7	40.3	41.0	41.0	58
59	44.5	38.7	43.8	39.5	43.7	39.6	43 2	40.2	42.4	41.0	41.7	41.7	59
60	45.3	39.4	44.4	40.1	44.5	40.3	43.9	40.9	43.2	41.7	42.4	42.4	60
61	46.0	40.0	45.3	40.8	45.2	41.0	44.6	41.6	43.9	42.4	43.1	43.1	61
62	46.8	40.7	46.1	41.5	45.9	41.6	45.3	42.3	44.6	43.1	43.8	43.8	62
63	47.5	41.3	46.8	42.2	45.7	42.3	46.1	43.0	45.3	43.8	44.5	44.5	63
64	48.3	42.0	47.6	42.8	47.4	43.0	46.8	43.6	46.0	44.5	45.3	45.3	64
65	49.1	42.6	48.3	43.5	48.2	43.7	47.5	44.3	46.8	45.2	46.0	46.0	65
66	49.8	43.3	49.0	44.2	48.9	44.3	48.3	45.0	47.5	45.8	46.7	46.7	66
67	50.6	44.0	49.8	44.8	49.6	45.0	49.0	45.7	48.2	46.5	47.4	47.4	67
68	51.3	44.6	50.5	45.5	50.4	45.7	49.7	46.4	48.9	47.2	48.1	48.1	68
69	52.1	45.3	51.3	46.2	51.1	46.3	50.5	47.1	49.6	47.9	48.8	48.8	69
70	52.8	45.9	52.0	46.8	51.9	47.0	51.2	47.7	50.4	48.6	49.5	49.5	70
71	53.6	46.6	52.8	47.5	52.0	47.7	51.9	48.4	51.1	49.3	50.2	50.2	71
72	54.3	47.2	53.5	48.2	53.4	48.4	52.7	49.1	51.8	50.0	50.9	50.9	72
73	55.1	47.9	54.2	48.8	54.1	49.0	53.4	49.8	52.5	50.7	51.6	51.6	73
74	55.8	48.6	55.0	49.5	54.8	49.7	54.1	50.5	53.2	51.4	52.3	52.3	74
75	56.6	49.2	55.7	50.2	55.6	50.4	54.9	51.1	53.9	52.1	53.0	53.0	75
76	57.4	49.9	56.5	50.9	56.3	51.0	55.6	51.8	54.7	52.8	53.7	53.7	76
77	58.1	50.5	57.2	51.5	57.1	51.7	56.3	52.5	55.4	53.5	54.4	54.4	77
78	58.9	51.2	58.0	52.2	57.8	52.4	57.0	53.2	56.1	54.2	55.2	55.2	78
79	59.6	51.8	58.7	52.9	58.5	53.1	57.8	53.9	56.8	54.9	55.9	55.9	79
80	60.4	52.5	59.4	53.5	59.3	53.7	58.5	54.6	57.5	55.6	56.6	56.6	80
81	61.1	53.1	60.2	54 2	60.0	54.4	59.2	55.2	58.3	56.3	57.3	57.3	81
82	61.9	53.8	60.9	54.9	60.8	55.1	60.0	55.9	59.0	57.0	58.0	58.0	82
83	62.6	54.5	61.7	55.5	61.5	55.7	60.7	56.6	59.7	57.7	58.7	58.7	83
84	63.4	55.1	62.4	56.2	62.2	56.4	61.4	57.3	60.4	58.4	59.4	59.4	84
85	64 1	55.8	63.2	56.9	63.0	57.1	62.2	58.0	61.1	59.0	60.1	60.1	85
86	64.9	56.4	63.9	57.5	63.7	57.8	62.9	58.7	61.9	59.7	60.8	60.8	86
87	65.7	57.1	64.6	58.2	64.5	58.4	63.6	59.3	62.6	60.4	61.5	61.5	87
88	66.4	57.7	65.4	58.9	65.2	59.1	64.4	60.0	63.3	61.1	62.2	62.2	88
89	67 2	58.4	66.1	59.6	65.9	59.8	65.1	60.7	64.0	61.8	62.9	62.9	89
90	67.9	59.0	66.9	60.2	66.7	60.4	65.8	61.4	64.7	62.5	63.6	63.6	90
91	68.7	59.7	67.6	60.9	67.4	61.1	66.6	62.1	65.5	63.2	64.3	64.3	91
92	69.4	60.4	68.4	61.6	68.2	61.8	67.3	62.7	66.2	63.9	65.1	65.1	92
93	70.2	61.0	69.1	62.2	68.9	62.5	68.0	63.4	66.9	64.6	65.8	65.8	93
94	0.9	62.7	69.9	62.9	69.7	63.1	68.8	64.1	67.6	65.3	66.5	66.5	94
95	71.7	62.3	70.6	63.6	70.4	63.8	69.5	64.8	68.3	66.0	67.2	67.2	95
96	72.5	63.0	71.3	64.2	71.1	64.5	70.2	65.5	69.1	66.7	67.9	67.9	96
97	73.2	63.6	72.1	64.9	71.9	65.1	70.9	66.2	69.8	67.4	68.6	68.6	97
98	74.0	64.3	72 8	65.6	72.6	65.8	71.7	66.8	70.5	68.1	69.3	69.3	98
99	74.7	65.0	73.6	66.2	73.4	66.5	72.4	67.5	71.2	68.8	70.0	70.0	99
100	75.5	65.6	74.3	66.9	74.1	67.2	73.1	68.2	71.9	69.5	70.7	70.7	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	49 Deg.		48 Deg.		4¼ Points		47 Deg.		46 Deg.		4 Points		Dist.

The Uſe and Explanation of the Table of Difference *of* Latitude *and* Departure.

THIS is a Table larger and better contriv'd than any of this Nature yet extant, giving the Difference of Latitude and Departure in Minutes and Tenths, and to any Diſtance not exceeding 100 Miles to every Degree and Quarter-point of the Compaſs; and may be uſed to a greater Diſtance, being taken out at twice or thrice, according to the Quantity of the Diſtance, as ſhall be ſhewn in the Uſe.

The Courſe ſtands at the Head and Foot of the Table, to every Deg. and Quarter-point of the Compaſs; at the Head it begins at 1 deg. ſo 2 deg. ¼ point, *&c.* encreaſing to 45 deg. or 4 Points. At the Foot it begins at 45 deg. or 4 Points, ſo 46 deg. 47 min. 4¼ Points, *&c.* encreaſing backwards to 90 deg. or 8 Points. The Diſtance ſtands in the two outmoſt Columns under the Title *Diſt.* which on the Left-hand Page begins at 1 and runs to 50; on the Right-hand Page it begins at 51, and runs to 100, the Difference of Latitude and Departure ſtands under the Courſe at the Head, and over it at the Foot of the Table.

The USE *of the Table.*

This Table is very uſeful in Navigation, eſpecially in working a *Traverſe.*

Example 1. The Courſe and Diſtance given, to find the Difference of Latitude and Departure by the Table.

Suppoſe a Ship ſailes NNE. ¾ E. 95 Miles, and the Difference of Latitude and Departure required.

On the Right-hand Page (becauſe the Diſtance is above 50) and at the top (becauſe it is leſs than 4 Points) look for 2¾ Points, which is the Courſe; under which, and againſt 95 the Diſtance, and under the Title *Lat.* ſtands 81.5, which is 81 min. $\frac{5}{10}$ the Difference of Latitude, and under the Title *Dep.* ſtands 48.8, which is 48 min. $\frac{8}{10}$ which is the Departure required.

Example 2. Suppoſe a Ship ſails South 56 deg. Weſterly 48 Miles, the Difference of Latitude and Departure required.

On the Left-hand Page (becauſe the Diſtance is leſs than 50) and at the bottom (becauſe it is more than 45.d) look for 56d. the Courſe; over which, and againſt 48 the Diſtance, over the Title *Lat.* ſtands 26.8 that is 26 min. $\frac{8}{10}$ the Difference of Latitude; and over the Title *Dep.* ſtands 39.8, that is 39 min. $\frac{}{10}$ the Departure required.

Example 3. Suppoſe a Ship ſail North Weſt by North 160 Miles, and the Difference of Latitude and Departure required by the Table.

On the Right-hand Page at the top, look for 3 Points, the Courſe. Now becauſe the Table goes but to 100, take for 100 firſt; therefore under 3 Points, and againſt 100, under the Title *Lat.* ſtands 83.1 that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* ſtands 55.6, that is 55 min. $\frac{8}{10}$ the Departure, then for 60 under 3 Points, and againſt 60, under the Title *Lat.* ſtands 49.9, that is 49 min. $\frac{9}{10}$ the Difference of Latitude, and under the Title *Dep.* ſtands 33.3, that is 33 min. $\frac{3}{10}$ the Departure, then add the Difference of Latitude and Departure for 60, to the Difference of Latitude and Departure for 100, the Sum is 133 min. the Difference of Latitude, and 88$\frac{8}{10}$ the Departure required.

This Table is alſo uſeful in the Reſolution of the reſt of the Problems of *Plain Sailing*, which for Brevity ſake are omitted here, being taught at large, in the laſt Edition of *Practical Navigation*; but the general Uſe of it is in the exact working of a Traverſe.

Example 1. Suppoſe a Ship bound to a certain Port, ſails S. E. by S. 49 min. then ESE. ½ E. 52 min. then E. by N. ½ E. 62 min. then SSW. ½ W. 57 min. then S. ½ E. 39 min. to find the Difference of Latitude and Departure the Ship hath made.

Set down the ſeveral Courſes and Diſtances; firſt allowing for Leeway, if any; then proceed to look out the Difference of Latitude and Departure for each Courſe and Diſtance (by the Directions before given) in the Table, placing them in their proper Columns, (*viz.*) If the Courſe be Northerly, the Difference of Latitude muſt be put in the North Column; if Southerly, in the South Column; If the Departure be Eaſterly it muſt be put in the Eaſt Column; if Weſterly in the Weſt Column, as was before directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and ſubtract the leſſer Difference of Latitude and Departure from the greater, and the Remainder is the Difference of Latitude and Departure.

The TABLE.

Courſes	*Diſtances*	*Diff. of Latitude*		*Departure.*	
		North	*South*	*Eaſt*	*Weſt*
S E by S	49		40.7	27.2	
E S E ½ E	52		15.1	49.7	
E by N ½ E	62	06.1		61.7	
S S W ½ W	57		50.3		26.9
S ½ E	39		38.8	03.8	
		06.1	144.9	142.4	26.9
			06.1	26.9	
			138.8	115.5	

The whole Diff. of Lat. is 138$\frac{8}{10}$ S. the Dep. 115$\frac{5}{10}$ E. then to find the Courſe and Diſtance, find the Lat. and Dep. in their proper Columns, but the Tables not extending ſo far, I take half of each, *viz.* half the Diff. of Lat. 69.4, and half the Dep. 57.7 the neareſt to which, in the Columns of Lat. and Dep. in the Traverſe Table is 69.6 and 57.1, over which, at the Top I find 3½ Point for the Courſe South Eaſterly, or SE ½ S. and in the Column of Diſt. 90, which doubled (becauſe I took half the two Numbers) is 180 the Diſtance required.

Example 2. The Courſes being given in Degrees, which often happens, by reaſon of Allowance for the *Variation of the Compaſs*, and in the like Caſes

Suppoſe a Ship bound to a certain Port, ſails 65 Miles North, 34 deg. Weſtnrly. Then 56 Miles North 67 deg. Weſterly. Then 48 Miles South, 78 degrees Weſterly. Then 54 Miles North, 23 deg. Eaſterly. Then 36 Miles North, 6 deg. Eaſterly, and the Difference of Latitude and Departure required.

The Table.

Courſes		Diſtances	Diff. of Latitude		Departure.	
			North	South	Eaſt	Weſt
NW	34°	65	53.9			36.3
NW	67°	56	21.9			51.5
SW	78°	48		10.0		47.0
NE	23°	54	49.7		21.1	
NE	6°	36	35.8		03.8	
			161.3	10.0	24.9	134.8
			10.0			24 9
			151.3			109.9

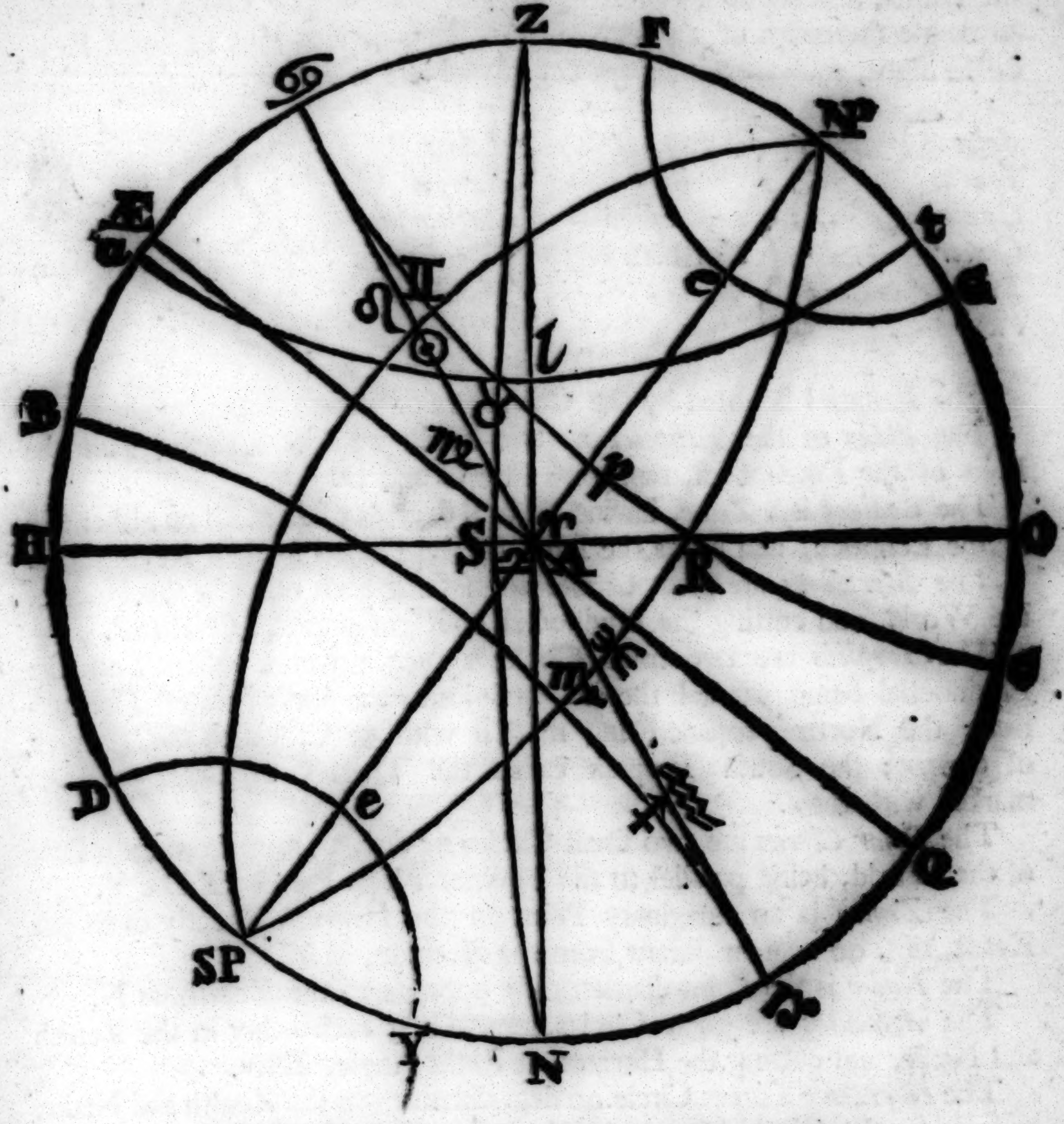
The whole Diſference of Lat. is 151 $\frac{3}{10}$ North, the Depariure 109 $\frac{8}{10}$ Weſt. The Courſe and Diſtance is found as in the laſt Example.

But if you would keep a Reckoning both in Latitude and Longitude, you may alſo find the Difference of Longitude by the *Traverſe Table*, (according to *Middle Latitude* Sailing) thus: Find the Complement of Middle Latitude in the Degrees, at the Top or Bottom of the Table, and under or above that in the Column of Departure; find your Departure, and right againſt that, in the Column of Diſtance, you have the Difference of Longitude.

Examp. Suppoſe in the laſt Inſtance of a *Traverſe*, the Ship hath ſailed from Latitude 50 deg. 00 min. North; then becauſe the Difference of Latitude is 151 min. or 2 deg. 31 min. the Latitude come to is, 52 deg. 31 min. and conſequently the Middle Latitude is 51 deg. 16 min. its Complement 38 deg. 44 min. which being neareſt 39 deg. I look for 39 at the Head of the Table, and under it in the Column of Dep. I look far the Departure 110, but the Table not proceeding ſo far, I take its half, *viz.* 55, the neareſt to which in the Table, is 54.7 (being leſs) againſt which, in the Column of Diſtance is 87, which doubled (becauſe I took half the Departure) the Sum 174 min. or 2° 54′ is the Difference

of

Longitude required, which is ſufficiently exact for common Practice; only I would adviſe all Perſons for avoiding as much as poſſible any Error, that every Time the Reckoning is corrected by an Obſervation, the Longitude be alſo corrected according to *Mercator's* Sailing, as you are taught in the laſt Edition of Practical Navigation.



Some neceſſary Aſtronomical Definitions.

THE Poles of the Equinoctial (commonly called the Poles of the World) are two fixed Points in the Heavens, oppoſite one to another; the one viſible to us, called the North Pole, marked with the Letters N. P; the other not viſible to us, called the South Pole, marked with S. P.

The *Axis* of the World is a Line imagined to paſs from Pole to Pole, about which is performed the diurnal Revolution, as the Line NPASP.

The *Equinoctial* is a great Circle 90 deg. diſtant from the Poles of the World, and divides the Globe into the North and South Hemiſpheres; it is noted by the Letters ÆAQ.

The *Ecliptick* is a great Circle inteſrecting the Equinoctial in two oppoſite Points, the beginning of *Aries* and the beginning of *Libra*, and makes an Angle therewith of 23 deg. 29 min. It is divided into 12 equal Parts, called Signs, each containing 30 deg. which are as follow.

Aries	♈	called Northern Signs	*Libra*	♎	called Southern Signs.
Taurus	♉		*Scorpio*	♏	
Gemini	♊		*Sagitarius*	♐	
Cancer	♋		*Capricornus*	♑	
Leo	♌		*Aquarius*	♒	
Virgo	♍		*Piſces*	♓	

The *Ecliptick* is noted by the Characters of the 12 Signs, as above.

The Poles of the *Ecliptick* are two Points 23 deg. 29 min. from the Poles of the Equinoctial, repreſented by G and D.

The *Zodiack* is a Zone, having about 8 degrees of Breadth on either ſide of the Ecliptick, and limits the Latit. of the Planets in their Revolutions.

The *Meridians* are great Circles interſecting each other in the Poles of the World, and cutting the Equinoctial at Right-angles, as NPRSP.

The *Tropicks* are two ſmall Circles 23 deg. 29 min. diſtant from the Equinoctial being parallel thereto, and limits the Sun's greateſt Declination; the North Tropick being mark'd with ♋ C, called the Tropick of *Cancer*; the South Tropick called the Tropick of *Capricorn*, and marked with B ♑.

The *Polar Circles* are two ſmall Circles 23 deg. 29 min. from each Pole of the World, being parallel to the Equinoctial, as F e G and D e Y.

The *Zenith* is an imaginary Point in the Heavens directly over our Heads, *viz.* 90 degrees diſtant from the Horizon, as Z.

The *Nadir* is the Point diametrically oppoſite to the Zenith, as N.

The *Azimuths* are great Circles interſecting each other in the Zenith and Nadir, and cutting the Horizon at Right Angle, ZSN.

The *Horizon* is a great Circle 90 deg. diſtant from the Zenith and Nadir, and divides the World into the viſible and inviſible Hemiſpheres, as HAO.

The *Meridian* of a Place, is that Meridian that paſſeth by the Zenith and the Nadir of the ſaid Place, and is repreſented by the Circle ZNPOQNSPHÆZ.

Parrallels of Altitude or *Almicanters*, are ſmall Circles parrellel to the Horizon; imagined to paſs through any Degree of Altitude between the Horizon, and the Zenith, as a l t.

Parrallels.

Parallels of Declination or *Latitude*, are ſmall Circles parallel to the Equinoctial, and are called Parallels of Declination, with reſpect to the Heavens, and Parallels of Latitude reſpecting the Earth, as ♋ PRC.

The *Latitude* of a Star, is an Arch of a Circle of Longitude, contained between the Center of the Star and the Ecliptick, and is accounted either Northerly or Southerly.

The *Longitude* of a Star, is an Arch of the Ecliptick, contained between the Circle of Longitude paſſing by the Star, and the beginning of *Aries*, and is accounted according to the Order of the Signs.

The Declination of the Sun or Star, is an Arch of the Meridian, contained between the Center of the Sun or Star, and the Equinoctial, and is accounted either Northerly or Southerly.

The *Right Aſcenſion* is that Degree and Minute of the Equinoctial, that comes to the Meridian with the Center of the Sun or Star.

Oblique Aſcenſion is the Degree and Minute of the Equinoctial, that riſeth with the Center of the Sun or Star.

Oblique Deſcenſion is the Degree and Minute of the Equinoctial, that ſets with the Center of the Sun or Star.

Aſcenſional Difference is an Arch of the Equinoctial, contained between the Right and Oblique Deſcenſion or Aſcenſion, or it is the Defference of Time between the Sun-riſing or Setting, and Six a Clock.

The *Amplitude*, is an Arch of the Horizon, being the Diſtance of the Riſing or Setting of the Sun or Star from the Eaſt or Weſt, and is accounted either Northerly or Southerly.

The Latitude of a Place, is the height of the Pole above the Horizon, or the diſtance between the Zenith and the Equinoctial.

Longitude on the Earth, is an Arch of the Equinoctial, contained between the Meridian of the Place where the Longitude is aſſigned to begin, and the Meridian of any other Place, and is accounted Eaſterly and Weſterly.

Aſtronomical Problems uſeful in Navigation.

PROBLEM I.

THE Sun's Place and greateſt Declination given, to find it's preſent Declination.

Example.

Suppoſe the Sun's Place to be 20d. 30m. of *Gemini*, the greateſt Declination is 23d. 29m. it is required to find the preſent Declination.

The Operation by the Logarithms.

As Radius	10.000000
Is to S. Sun's greateſt Declination 23d. 29m.	9.600409
So is S. Sun's Longitude 80d. 30m. from *Aries*	9.994003
To S. Sun's preſent Declination 23d. 08m. North	19.594412

By the Gunter.

The Extent from Radius S. 90°, to S. 23° 29', ſhall reach from S. 80° 30' to the S. 23° 08' the Sun's *Declination* North becauſe in a Northern Sign.

Note, The Sun's Longit. is reckoned from the next Equinoctial Point, Therefore if the Sun be in *Aries*, *Taurus*, *Gemini*, *Capricornus*, *Aquarius*, or *Piſes*, the Longitude is accounted from *Aries*: but if in *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, *Sagittarius*, it is accounted from *Libra*.

Aries, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, are called Northers Signs; *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius*, and *Piſces*, are called Southern Signs. Conſequently, if the Sun's Place be in any of the firſt ſix Signs, the Declination is North; but if in any of the latter ſix, the Declination is South.

PROB. II.

The Sun's greateſt Declination and preſent Declination given, to find his Place.

The Sun's greateſt Declinaton is 23° 29'; and preſent Declination is 18° 30' North increaſing, the Sun's Place required.

By the Logarithms.

As the S. of the Sun's greateſt Declination 23° 29' ——— 9.600409

To Radius ——— 10.000000

So is the Sine of the preſent Declination 18° 30' North ——— 9.501476

To the Sine Sun's Longitude 52° 46' ——— 9.901067

That is one Sign (30° making a Sign) and 22° 46' from *Aries*, becauſe the Declination is North and increaſing, that is 22° 46' of *Taurus*; but if the Declination had been North decreaſing, it muſt have been accounted from *Libra*, and then it would have been 7° 14' in *Leo*.

By the Gunter.

The Extent of the Compaſſes from the Sine 23° 29' the greateſt Declination, to Radius S. 90° ſhall reach from S. 18° 30', the Sun's preſent Declination, to S. 52° 46' the Sun's Longitude as above.

PROB. III.

The Sun's Place and greateſt Declination given, to find the Right Aſcenſion.

Example

The Sun's Place 10° 30' in *Aquarius*, and the Right Aſcenſion required

The Operation by the Logarithms.

As Radius ——— 10.000000

To the Tangent of the Sun's Longitude from *Aries* 49° 30' ——— 10.068501

So is the Sc. of the greateſt Declination 23° 29' ——— 9.962453

To the Tangent of the Sun's Right Aſcenſion 47° 2' ——— 10.030954

By the Gunter.

The Extent from Radius S. 90° to Sc. of the greateſt Declination 66° 31′ ſhall reach from Tangent Sun's Longitude from *Aries*, 49° 30′ to Tangent Right Aſcenſion 47° 2′ required.

Note, This Proportion gives the Sun's Right Aſcenſion from the next Equinoctial Point; but it ought to be accounted from *Aries*, according to the Order and Succeſſion of the Sign, and therefore in this Caſe 47° 02′ ſubtracted from 360d. gives 312d. 58m. the Right Aſcenſion from *Aries*.

PROB. IV.

The Latitude of a Place, and the Sun's Declination given, to find the Sun's Amplitude?

Example.

The Latitude 51d. 32m. North, and the Sun's Declination 15d. 20m. North, what is the Amplitude?

The Operation by the Logarithms.

As Sc. of the Latitude 51d. 32m.	9.793832
To Radius	10.000000
So is S. of the Declination 15d. 20m. North.	9.422318
To the S. of the Sun's Amplitude 25d. 9m.	9.628486

By the Gunter.

The Extent from the Sc. of the Latitude 38d. 28m. to the Sine of the Declication 15d. 20m. North, ſhall reach from Radius S. 90d. to S. 25d. 9m. the Sun's Amplitude North, as above.

Nete, If the Declination be North, the Amplitude is North, and if the Declination be South, the Amplitude is alſo South.

PROB. V.

The Latitude of a Place, and the Sun's Declination given, to find the Aſcenſional Difference.

Example.

Suppoſe in the Latitude 51 deg. 32 min. North, the Sun's Declination is 10 deg. 45 min. North, and the Aſcenſional Difference required.

The Operation by the Logarithms

As Tangent Complement Latitude 51 deg. 32 min.	9.900085
To Radius	10.000000
So is the Tangent of the Sun's Declination 10d. 45m.	9.278424
To S. of the Aſcenſional Difference 13° 49′	9.378339

By

By the Gunter.

The Extent from Tangent 38° 28′ (the Comp of Latitude) to Tangent 10 deg. 45 min. the Sun's Declination; ſhall reach from Radius S. 90d. to S. 13 deg. 49 min. the Sun's Aſcenſional Difference, as above.

PROB. VI.

To find the Oblique Aſcenſion and Deſcenſion.

Firſt, Find the Aſcenſional Difference by the fifth Problem.

Secondly, the Right Aſcenſion by the third Problem.

Then if the Sun's Declination be North, the Aſcenſional Difference ſubtracted from the Right Aſcenſion, gives the Oblique Aſcenſion, and added thereto, gives the Oblique Deſcenſion. But if the Sun's Declination be South, the Aſcenſional Difference added to the Right Aſcenſion, gives the Oblique Aſcenſion, and ſubtracted gives the Oblique Deſcenſion.

Note, That if the Aſcenſional Difference exceed the Right Aſcenſion, add to the Right Aſcenſion 360 Degrees, then ſubtract the Aſcenſional Differenee therefrom.

Or if both being added together exceed 360d. the Exceſs is the Oblique Aſcenſion or Deſcenſion.

PROB. VII.

To find the Time of the Sun's riſing and ſetting, and length of the Day or Night.

Find the Aſcenſional Difference by the fifth Problem, which convert into Hours and Minutes of Time, accounting for 15 deg. of the Equinoctial one Hour, and for every degree 4 Minutes of Time, and for every 15 Minutes of the Equinoctial 1 Minute of Time.

If the Sun's Declination be Northerly, the Aſcenſional Difference added to ſix Hours, gives the Time of Sun-ſetting, and ſubtracted is the Time of Sun-riſing.

If the Declination be Southerly, contrarily the Aſcenſional Difference added, gives the Time of Sun-riſing; ſubtracted is the Time of ſetting.

The Time of Sun-ſetting doubled, gives the Length of the Day; the Time of Sun-riſing doubled, is the Length of the Night.

Example.

In Latitude 51d. 32m. North, ſuppoſe the Sun's Declination 21d. 57m. North, the Aſcenſional Difference is 30d. 29m. which reduc'd into Time is

	H.	M.		H.	M.
	2	02			
	6	00			
Sun ſetteth ——	8	02	doubled is	16	04 length of the Day.
Sun riſeth ——	3	58		7	56 length of the Night.

PROB. VIII.

The Latitude of a Place, the Sun's Altitude and Declination given, to find the Azimuth required.

The Rule.

Take the Complement of the Altitude, the Comp. of the Latitude, and the Comp. of the Declination to 90 deg. add them together, and take the half Sum; ſubtract the Compl. of the Declination from the half Sum, and take the Remainder; then ſet down the Compl. Arithmetical of the Sines of the Compl. Altitude, and Compl. Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of theſe four Logarithms is the Sc. of half the Azimuth required.

Note, If the Declination be South in North Latitude, or North in South Latitude, inſtead of taking the Complement of the Declination to 90 deg. there muſt be 90 deg. added thereto, and then proceed as before.

The Operation by the Logarithms.

d. m.
42 : 30 Compl. Altitude ——— S. Co. Ar. 0.170317
38 : 28 Compl. Latitude ——— S. Co. Ar. 0.206168
69 : 30 Compl. Declination

150 ; 28 Sum

75 : 14 Half Sum S. ——— 9.985414
5 : 44 Exceſs of the half Sum above c. Decl. S. ——— 8.999560

Sum 19.361459

61d. 21m. ——— Sc. ——— half Sum 9.680729
61d. 21m.
doubled 122d. 42m. the Sun's Azimuth from the North required.

The Operation by Gunter's-Scale.

The Extent of the Compaſſes from Radius S. 90 deg. to S. 42 deg. 30 min. the Complement of the Altitude, ſhall reach from S. 38d. 28m. the Complement of the Latitude, to S. 24 deg. 40 min. then the Extent from Sine 24 deg. 40 min. to Sine 75 deg. 14 min. the half Sum ſhall reach from Sine 5 deg. 44 min. the Exceſs of the half Sum, above the Complement Declination to 122 deg. 42 min. (upon the Line of Verſed Sines) which is the Azimuth required.

Example.

Examp. 2. In the Latitude of 51 deg. 32 min. North, the Sun's Declination is 18 deg. 15 min. South, his Altitude 17 deg. 45 min. and the Azimuth from the North required.

The Operation by the Logarithms.

d.	m.		
72	15	Comp. Altitude —— S. Co. Ar.	0.021182
38	28	Comp. Latitude —— S. Co. Ar.	0.206168
108	15	Declination 90 deg. being added, becauſe South.	
218	58	Sum	
109	29	Half-ſum Comp. to 180° is 70° 31′ S. ——	9.974391
1	14	Remainder —— S. ——	8.332924
			Sum 18.534665

d. m.

79 : 20 —— Sc. —— half-ſum 9.267332

79 : 20

which doubled is —— 158 : 40 the Azimuth from the North required.

By the Gunter.

The Extent from Radius S. 90d. to the Sine 72d. 15m. the Compl. Altitude, ſhall reach from the Sine 38d. 28m. the Complement Latitude, to the S. 36d. 20m. then the Extent from the S. 36d. 20m. to S. 70d. 31m. the Complement of 109d. 29m. (the half-Sum) to 180d. ſhall reach from the Remainder S. 1d. 14m. to 158d. 40m. (upon the Line of Verſed Sines) the Sun's Azimuth as above.

In South Latitude, the Operation is the ſame with the two preceding Examples, only the Azimuth is found from the South.

After the ſame manner you may find the Azimuth of any Star.

PROB. IX.

The Latitude of the Place, the Sun's Declination and Altitude being given, to find the Hour of the Day.

Example. In the Latitude 51 deg. 32 min. North, ſuppoſe the Sun's Declination 23 deg. 29 min. North, the Altitude 36 deg. 30 min. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude to 90°, add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and take the Remainder, then ſet down the Complement Arithmetical of the Sine Complement of the Declination, and Complement Latitude, and thereto add the Sines of the half Sum and Remainder: half the Sum of theſe four Logarithms, is the Sc. of the half Time required in Degrees and Minutes of the Equinoctial.

The Operation by the Logarithms.

d.	m.			
66	31	Compl. Declination	S. Co. Ar.	0.037547
38	28	Compl. Latitude	S. Co. Ar.	0.206168
53	30	Compl. Altitude		
158	29	Sum		
79	14	Half Sum	Sine	9.992287
25	44	Remainder	Sine	9.637673
			Sum	19.873675
d.	m.			
30	09	Sc.	Half Sum	9.936837
30	09			

which doubled is 60 18 and reduced into Time, makes 4 hours 1 min. 1/5, the Hour of the Day in the Afternoon.

But if it had been in the Forenoon, 4 hours 1 min. 1/5 ſubtracted from 12 hours, leaves 7 hours 58 min. 4/5 for the Time in the Morning.

If the Declination had been Southerly, then inſtead of taking the Complement of the Declination to 90 deg. there muſt be 90 deg. added thereto, as in the ſecond Example of the Eighth Problem; do the ſame when the Declination is North in South Latitude.

By the Gunter.

The Extent of the Compaſſes from Radius S. 90d. to S. 66d. 31m. the Complement of the Declination, ſhall reach from S. 38d. 28m. the Complement Latitude, to S. 34d. 40m. then the Extent from S. 34d. 40m. to the S. of 79d. 14m. the half Sum ſhall reach from S. 25d. 44m. the Remainder, to 60d. 18m. (upon the Line of verſed Sines) the hour of the Day as above.

PROBLEM X.

Having the Latitude of the Place, the Sun's Right Aſcenſion, with the Right Aſcenſion, Declination, and Altitude of a Star given, to find the Hour of the Night.

Example.

In the Latitude of 51 deg. 32 min. North, on the 7th of *January*, 1741, the Sun's Right Aſcenſion was 20 hours 1 min. the Right Aſcenſion of the *Lyon's Tail* was 11 hours 31 min. the Declination 16 deg. 10 min. North, the Altitude 30 deg. 30 min. to the Eaſtward of the Meridian, the Hour of the Night required.

The RULE.

Take the Complement of the Star's Declination, the Complement of the Latitude of the Place, and the Complement of the Star's Altitude; add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and reſerve the Remainder; then ſet down the Complement Arithmetical of the Sines of the Complement of the Star's Declination and of the Latitude of the Place, and thereto add the Sines of half the Sum and Remainder: Half the Sum of theſe four Logarithms, is the Sc. of half the Diſtance from the Meridian.

The Operation by the Logarithms.

d. m.
73 : 50 Compl. Star's Declination —— S. Co. Ar. 0.017523
38 : 28 Compl. Latitude —— S. Co. Ar. 0.206168
59 : 30 Compl. Star's Altitude

171 : 48 Sum

85 : 54 Half Sum —— Sine —— 9.998887
26 : 24 Remainder —— Sine —— 9.648004

Sum 19.870291

30d. 31m. —— Sc. —— Half Sum 9.935291
30d. 31m.

which doubled is 61d. 02m. and reduced into Time, gives four Hours, four Minutes, 8 Seconds, or $\frac{4}{7}$ of a Minute.

By the Directions given in the Uſe of the Table of the Sun's Right Aſcenſion, and of the Right Aſcenſion and Declination of the fixed Stars, find the Time of the Star's coming upon the Meridian, if the Star be to the Eaſtward of the Meridian ſubtract the Star's Diſtance from the Meridian in Time, from the Time of the Star's coming upon the Meridian;

but if the Star be to the Weſtward of the Meridian, add the Star's Diſtance from the Meridian, to the Time of the Star's coming on the Meridian; the Sum or Difference is the hour of the Night. In this Example, The Sun's Right Aſcenſion 20 Hours 01 Minute ſubtracted from the Star's Right Aſcenſion (with 24 Hours added thereto) 35 Hours 31 Minutes; leave 15 Hours 30 Minutes, the Time of the Stars coming on the Meridian; from which ſubtracting 4 Hours 4 Minutes leaves 11 Hours 26 Minutes; the Hour of the Night.

Note farther, If the Star's Declination be South in North Latitude, or North in South Latitude, inſtead of taking the Complement Declination, to 90 deg. there muſt be 90 deg. added thereto, as has been ſhewn in the Eighth preceding Problem.

The Operation by Gunter's-Scale.

The Extent of the Compaſſes from Radius S. 90d. to the S. of 73 degrees 50 Minutes the Complement of the Star's Declination, ſhall reach from S. 38 Degrees 28 Minutes the Complement of the Latitude, to the S. of 36 Degrees 40 Minutes; then the Extent from S. 36 Degrees 40 Minutes, to S. 85 Degrees 54 Minutes the half Sum, ſhall reach from S. 26 Degrees 24 Minutes the Remainder, to 61 Degrees 02 Minutes (upon the Line of Verſed Sines required.) With which proceed as has been directed to find the Hour of the Night.

Courſes and Diſtances between ſome of the moſt eminent Places on the Coaſt of England, *&c. As alſo the thwart Courſes between the Eaſt Coaſt of* England *and* Holland, *the South Coaſt of* England *and* France, *and the Weſt Coaſt of* England *and* Ireland.

	Leag.
FROM *Whitby* to *Tinmouth*, NW. by N.	14
From *Bockneſs* to *Catneſs*, North Weſt	27
From the *North Foreland* to *Fluſhing*, Eaſt	24½
From the *North Foreland* to the *Texel*, North Eaſt	52
From the *Spurn* to the *Texel*, Eaſt by South	56
From *Tinmouth* to the *Naze of Norway*, NE by E.	120
From *Tinmouth* to *Holy Land*, Eaſt by South	116
From *Tinmouth* to the *Scaw*, ENE.	110
From *Yarmouth* to the *Texel*, Eaſt by North	34

From *Newcaſtle* to *Maes Deep*, ENE. —— —— 83
From *Aberdeen* to *Maes Deep*, South Eaſt —— —— 113
From the *North Foreland* to the *Maes*, ENE. —— —— — 30
From *Newcaſtle* to the *Fly*, ESE. —— —— 90
From *Scarborough* to *Holy Land*, Eaſt Northerly —— — 97
From the *Start* to the *Eddyſtone*, Weſt half South —— —— 6
From the *Lands End* to *Silly*, *W. S. W. ¾ W* —— —— 9
From the *Caskets* to *Blackneſs*, Eaſt North Eaſt —— —— 55
From *Beachy* to *Blackneſs*, Eaſt a quarter North —— — 15
From *Dover* to *Diep* South half Weſt —— —— —25
From the *Lizard* to *Guernſey*, Eaſt by South —— —— 35
From the *Start* to the *Seven Iſles*, South half Eaſt —— 25
From *Silly* to *Uſhant*, South Eaſt by South —— —— —— 35
From the *Lizard* to *Uſhant*, South —— —— —— 27
From *Hartland Point* to the Iſland of *Londey*, North —— —— 3
From *Londey* to the *Holms*, Eaſt by North —— —— 18
From *Black Rock* to *Tuſcar*, Eaſt North Eaſt —— —— 3
From Cape *Clear* to *Old Head*, Eaſt by North —— —13
From *Greſholm* to *Waterford*, Weſt by North —— —— 21
From the *Land's End* of *England* to *Tuſcar*, North by Weſt —— 40
From the *Land's End* of *England* to *Waterford*, North North Weſt 40
From *Holy Head* in the Iſland of *Angleſey*, to the Bar of *Dublin*, W by N 18½
From *Rochel* to *Black Rock*, South by Eaſt —— —— 80
From the *Land's End* of *England* to *Cape Clear*, N W by W —— 55
From the *Land's End* of *England* to *Old Head*, North Weſt —— 45

A Table of the Soundings coming into the Channel, *reſpecting the Bearing and Diſtances of* Silly, Uſhant, *the* Lizard, *&c. with the Depth in Fathoms and the vraious ſorts of Ground.*

	Bearing	Diſt.	Lat. D.	Lat. M.	Dep.	*The various ſorts of Ground.*
Silly	South	05	50	20	50	Branny ſand, like Ground Wheat
	SSE	05	50	12	45	White ſand mixed with ſhells
	SSE	06			50	Coarſe Owſe
	ESE	06			53	Coarſe ſand and fine red ſhells
	E by *S*	08	50	12	78	Owſe ſand, with Queen ſhells amongſt it
	E by *N*	07	49	15	72	Owſe like Muſtard-ſeed, with broken ſhells
	E by *N*	15	48	50	72	Pepper ſand, black and yellow

E by N

Silly

Bearings	Diſt.	Lat.		Dep.	*The various ſorts of Ground.*
		D.	M.		
E by N	24	49	50	72	Black, white, and red Stones with Owſe
E N E	07	49	15	60	Some black Sand
E N E	20	49	15	80	Rocky Ground
E N E	55			103	Fine white ſand
N E by E	22	49	10	85	Sand and Owſe together
N E by E	10	49	20	55	White and red ſand mix'd with ſhells
N E by E	50	49	50	100	White ſand with Owſe and Nits
N E by E	25	49	50	64	Branny ſand with white and red ſhells
N E by E	06	49	10	48	Black ſand
N E by E	13	49	43	65	Branny ſand with ſome pieces of ſhells
North Eaſt	10	49	40	65	Branny ſand, ſmall ſtones, Herring Bones
N E by N	10	49	20	57	Small red Sand
N N E	10	49	47	100	White ſand then entring on the Bank
N by E	18			68	Red ſand with black & white ſcollop ſhells
North	12	49	15	65	Broken ſhells with white and red ſand
North	10	49	47	65	White ſand on the E. part of the Bank
N N W	33	48	52	77	Red ſand and ſhells amongſt it
NW by N	07	49	40	54	Mere ſhells, the *Lizard NE.* diſt. 18 leag.
North Weſt	04	50	10	50	Branny ſand with black and broken ſhells
North Weſt	07	49	47	60	Stony Ground
NW by N	04	50	25	61	Red and black ſand, with gliſtering ſhells
NW by W	2½			44	Shells and ſand like the points of Needles
W by N	13	50	25	63	Fine white ſand with a little Owſe
Weſt	21	50	08	66	Red and black ſand with gliſtering ſhells
Weſt by S	32	49	50	75	Fine white ſand and gliſtering ſhells
Weſt by S	3½			40	Like broken Wheat or Coarſe Bran

Uſhant.

Bearings	Diſt.	Lat. D.	Lat. M.	Dep.	*The various ſorts of Ground.*
North	06	48	36	63	Full of ſmall Mace ſand
N by E	18	48	15	80	Round ſtones mixed with ſcollop ſhells
N E by N	11			60	Small beaten ſhells and Hakes Teeth
North Eaſt	29	48	50	85	Great and ſmall pieces of Cockle ſhells
North Eaſt	25	48	10	55	Gray and brown ſand with white ſhells
N E by N	07	48	30	68	White and gray Mace ſand
E N E	14	48	36	68	Small ſhells and Herring Bones
E by N	25	48	30	85	White and gray ſand with ſmall red ſtones
Eaſt	18	49	00	70	Branny ſand, with ſome ſhells
Eaſt	06	49	00	65	Red ſand, ſhells things like Needles points
Eaſt	15	49	15	70	Fine white ſand
Eaſt	33	49	15	87	Dazling ſand like Barley-ſtraw
Eaſt	04	49	10	60	Full of Mace ſand and broken ſhells

E by S

	Bearings	Dift.	Lat. D.	Lat. M.	Dep.	*The various ſorts of Ground.*
Uſhent.	E by S	04	48	56	63	Shells like Perriwinkles
	E S E	15	49	15	70	Shells gray and red pieces of Cockle ſhells
	E S E	12	49	20	68	Groſs white ſand with ſhells
	E S E	08	49	05	64	White ſhells and fine ſmall ſtones
	E S E	06			60	Hakes Teeth & ſhells like Oatmeal Husks
	SE by E	20	49	15	72	Great ſtones like Peaſe and Beans
	SE by E	09	49	15	65	Sand and ſome ſhells
	SE by E	37	48	30	65	James's ſhells
	SE by E	15	49	25	60	Small Scollop ſhells with ſome ſtones

	Bearings	Dift.	Dep.	*The various ſorts of Ground.*
Liſard.	North Eaſt	6½	43	Marſhy ſhells and ſome Scollop ſhells
	NE by N.	10	52	Marſhy ſhells and Hakes Teeth
	N N E	09	50	Marſhy ſhells like Oatmeal Husks
	N by E	15	58	Marſhy ſhells and Hakes Teeth
	North	01	39	Stones as big as Beans four Leagues off
	North Weſt	05	45	Gray ſand like Oatmeal Flower
	North Weſt	03	46	Marſhy ſhells and ſmall ſtones
	WNW	3½	47	Small ſhingly ſtones, and marſhy ſhells
	W by N	04	40	Fine Marſhy ſhells and white ſtones
	W by S	03	41	Black gravelly Ground with ſmall ſtones
	NE by E	12	57	Scollop ſhells
	NE by E	04	44	Great ſtones and rough Ground
	North Eaſt	6½	50	Like Husks of Oatmeal and ſmall ſtones

Eddiſtone.	N ¼ Mile		35	Dirty brown ſand and Hakes Teeth
	W 2 Mile		34	Dirty brown ſand
	S 1 Mile		26	Fine ſand, and within this 28 and 30 Fath.

Start	N by E. Nly	8½	40	Like the Duſt of a Grindſtone with Hakes Teeth and ſhells
	N W by W	4½	43	
	N W by N	03	38	Gravelly ſand, ſmall ſtones and ſhells
	NbyW. Wly	12	38	Reddiſh ſhells maſhed as if beat in a Morter, white ſand and ſcollop ſhells
	N W by W	14	43	

Foreland

	Bearings	Diſt.	Dep.	The various ſorts of Ground.
Foreland	NE by E	08	35	Small ſhingly ſtones as big as Peaſe
	North	08	40	Streamy Ground with ſmall ſtones
	N by E	5½	33	The ſame with ſome black ſands
	NE by N	11	41	Fine ſand and ſcollop ſhells
	N N E	08	40	Fine ſand, and ſcollop ſhells and ſmall ſtones
	N E by E	2½	27	Shingly Ground
	WNW	2½	20	Small ſtones
Needles	NE by E	02	17	Great ſhingly Ground
	N E ½ E	2½	15	Small ſhingly Ground
	North Eaſt	02	13	Rocky Ground
I. Wight	N by W	3½	20	All the Ground from *Albions* to the E. end of the *Wight* is chalky and brown ſand
	E by N	04	21	
	N by E	03	18	
Dunnoſe	W by S	04	16	Rough Ground with ſome big ſtones
	Weſt	04	21	A kind of ſandy fiſhy Ground
	WNW	08	33	Fiſhing Ground ſomewhat red, with ſtones as big as Peaſe, and ſmall Beans
	N by W	06	26	

Directions to ſail into ſome of the Principal Harbours on the Coaſt of England.

Directions to ſail into Silly.

SILLY is divided into divers Iſlands; along the Weſt-ſide lieth a great many Rocks. There are ſeveral Channels through which to go in, but the Southermoſt called St. *Mary's* Sound is the beſt, being a fair opening of the Channel, but near the midſt lie two ſunken Rocks, which in foul Weather the Sea may be ſeen to break over: It is beſt to leave them on the Larboard-ſide going in, and on the Starboard-ſide coming out: Go ſo near the Starboard ſhore, as that a Stone might almoſt be thrown on ſhore. And when you are within the Point, luff up round, and come to an Anchor in the ſight of the Houſes; or when the Town is brought open to the Valley, leave two thirds of the Harbour on the Larboard-ſide.

Directions for ſailing into Mount's Bay.

To anchor in Guavers Lake.

There is certainly two ſunken Rocks, which lie right in the way of going into the Lake, about a Mile without your Anchoring Place; theſe Rocks lye *NNW* and *SSE*. about half a Mile in length, to ſhun which obſerve as ſollows.

If the Wind is in the Eaſtern Hank give the Eaſtern ſhore about a League birth, and keep St. *Paul*'s Church wholly in ſight above the Hill, till you bring a Church on the Eaſtern ſhore a Sails breadth to the Northward of St. *Michael's Mount*, then bear away for the Lake Hill, keeping your Mark till you run St. *Paul*'s Church down under the Hill, then let go your NE. Anchor, and carry the other to the *SW*. and you will be well Moor'd, and in good fine Ground all Sand.

You may come in, keeping one half of the Church above the Hill, you'll clear them to the Eaſtward, and when it ſhuts down you are to the Weſtward of them, and when upon them the Top of the Tower and a long Hedge is in one, about 6 or 7 foot at low Water.

If the Wind is in the ſouthern or weſtern Hank keep the Land on board, which is bold; you may go within a quarter of a Mile of the Point; run till you ſhut *Moſebole* Iſland in, and St. *Paul*'s Church down under the Land well, to come too with your *SW*. Anchor, then carry the other to the NE. you will be well moor'd in fine Ground as before mention'd: Be ſure to have the Church on the Eaſtern ſhore a Sail's breadth to the Northward of the Mount.

If your Ground Tackling is good your Anchors will never ſtart, the Wind at *SSE*. or *SE*. heaves in a great Sea, and raiſes a great Ground Sea when blowing hard; the harder it blows you have a ſtronger Outſet in your Favour; there is no Tide, you always ride Head to Wind, your Anchors will ſooner ſtart with the Wind to the N. or NW. becauſe the Ground goes out with a little Deſcent.

To ſail into Foy.

Foy may be very eaſily known, lying in between two high Lands; on the Weſt ſide the going in, is an old Church and Caſtle, and on the Eaſt ſide the Ruins of an old Church, as you may ſee by the making of it in Capt. *Collin*'s Draught of *Foy*. The going in is a Cable's Length over from ſide to ſide and no Danger; when you are in you may Anchor before the Town, or run up above the Town. In the Time of the *Dutch* War, in the Year 1666, there was above ſixty Sail of *Virginia* Ships put into this Harbour. This Place lieth NE. and SW. in and out, which makes it a better Out-let to the Weſtward than *Plymouth* or *Falmouth*. And whereas it hath been reported to be a Bar-Harbour, and that you cannot enter till half Tide, I do aſſure you that there is no leſs than 3 Fathom at low Water at a Spring Tide: Here you may lie aſhore to waſh, tallow and ſtop Leaks; the Spring Tides riſe and fall 16 and 17 Foot, and it is high Water here at Full and Change half an hour paſt 5. There is good anchoring in the Road without the Harbour; from 5 to 10 Fathom Water, but without that Depth foul Ground.

To ſail into Falmouth.

Upon the Weſt Point of the Haven of *Falmouth*, ſtandeth a Caſtle on the high Land called *Pendennis* Caſtle. In the Entry neareſt the ſaid W. ſide lieth a Rock above Water, you may ſail in at either ſide of it, at the inner ſide of the Eaſt Point lie alſo ſome Rocks off the ſhore; on the Eaſt ſide *is* deepeſt Water, and moſt Room, therefore in going in, give the Eaſt Point a large Birth; there will be 7 or 8 Fathom. Keep the ſaid ſhore till you come within St. *Maude*'s Caſtle; which when it bears Eaſt there will be 16 or 17 Fathom, but half the Harbour over towards the *Smithick* is but 4 or 5 Fathom; obſerve in going in to keep the *Manacles* open and ſhut on the Point of *Falmouth Caſtle*, and ſo it muſt be kept till you ſhut the Church over *Penny Comquick*, into the N E. end of the *Smithick*, and ſo bear over to St. *Maude*'s, and ride with the Caſtle E. laying one Anchor in 18 Fathom, and the Weſtermoſt Anchor in 4 Fathom, as ſhall ſeem moſt convenient.

To ſail into Plymouth.

At the Eaſtermoſt Point of *Plymouth-ſound* lieth an high round Rock called *Mewſtone*; between it and the *Rambead* lieth the ſaid *Sound*. North North Eaſt, being round and deep.

A little to the Northward of *Rambead*, is a fair ſandy Bay where is good Anchoring cloſe under the Land, in 9 or 10 Fathom: South, a little Eaſterly from *Rambead*, lies a Rock above Water called the *Eddyſtone*, the Point of *Plymouth* lieth from it N. by E. diſtant about 4 Leagues.

In the *Sound*, by the Land of *Plymouth*, lieth an Iſland called St. *Nicholas*, or *Drake Iſland*, which is joined to the Weſt ſide, with a Range of Rocks under Water, ſo that you may ſail along to the Eaſtward of it.

To ſail into Catwater.

To ſail into *Catwater*, run in between the Iſland and the Point on the Eaſt-ſide with the Land of *Plymouth*, till *Catwater* open on the Starboard ſide, then go in to the Eaſtward between the Point of *Plymouth*, and the

Point on the Starboard-ſide, leaving moſt part of the Channel on the Starboard-ſide, until you come within the Point, and anchor there right againſt the high ſteep Northern Land; there is at low Water, with extraordinary high Tides 4 and 5 Fathom.

In ſailing into *Catwater*, be ſure to give a good Birth to the Southern Point of the Entry, for there lies off the ſaid Point a Ledge of Rocks under Water, about two Cable's Length off from the Land. Upon the Point of the Ledge lies a Buoy, where is about 12 foot Water at half Flood, which Buoy muſt be left on the Starboard-ſide going in, and when *Catwater* is altogether open you may run in to the Eaſtward, leaving in the Entry of the Harbour two thirds of the Channel on the Starboard-ſide, as aforeſaid, becauſe the South Shore is ſomewhat flat off, there lying a ſandy Bank, which reacheth to the ſecond Point of the South Shore of *Catwater*.

A little to the Eaſtward of *Drake Iſland* lies a Rock under Water, upon which at low Water, it is deeper than two Fathom. To ſail within the Land you may go to the Eaſtward or Weſtward of the Rock, as occaſion ſerves.

To ſail into Dartmouth.

Dartmouth hath a narrow Entry lying in between two high Lands: On each ſide of the Haven ſtandeth a little Caſtle; on the Weſt ſide is a Church on the high Land, called St. *Patrick*'s Church. To ſail in coming from the Weſtward, run in along by the Weſt Land, ſo far to the Eaſtward until the Key of the Village (on the Eaſt-ſide of the Haven) be brought in the midſt of the Entry of the Haven between the two Lands; it is convenient to have a Boat ready (if any Guſt of Wind ſhould come from the high Land) to row in. Being come in, edge over to the Weſt-ſide before the Brewhouſe, and anchor there in 10 or 11 Fath. or before the Village to the Eaſt-ſide at pleaſure. At the Eaſt-ſide lieth a ſunken Rock, to avoid which ſteer in with St. *Patrick*'s Church, and do not bring the Village, which ſtandeth on the Weſt-ſide of the Harbour, without the ſaid Church, but keep the outer Houſe of the ſaid Village in the Eaſt-ſide of the Chappel always in ſight, without the Bulwarks on the North-ſide by St. *Patrick*'s Church; then there is no Danger of the Rock, in the Range by the North Point. Between *Dartmouth* and the *Start*, neareſt to *Dartmouth* ſtandeth a white ſquare Steeple, called *Fackman*, which is a very good Mark to know *Dartmouth* by.

To ſail into Torbay.

Bring the Weſt Point of the *Berry* S. by E. or SSE. from you; and anchor there in 7 or 8 Fathom, where you ſhall be Landlock'd for a S. and S.W.

SW. Wind. At the North Eaſt end of the Bay is alſo a Tide Haven called the *Tormain*; before it is very good anchor Ground in 4 or 5 Fath. according as you deſire to be nearer or farther from the Shore.

Directions for ſailing in at the Eaſt-end of the Iſle of Wight to Portſmouth Harbour, *and alſo to* Hampton.

If you come from the Eaſtward with a Northerly Wind, bound into the *Iſle of Wight* or *Portſmouth*; after you come to the Weſtward of the Shoal called the *Owers*, hale in North Weſt with St. *Hellens* Point; but do not hale too much to the Northwards, for there lies a Bank off of *Longſtone* Haven, to the Eaſtward of the *Horſe*, that hath not above 13 foot on it at low Water; but keeping in 7 or 8 fath. carrieth you clear without it, and will bring you to the S. E. end of the Sand called the *Horſe*. St. *Hellen* Church being S. W. by W. from you, you may run in 5 fath. and when you have brought the Weſtermoſt great white Patch, or Chalk upon *Parch Down*, (which is the high Land to the Northwards of *Portſmouth*) a Ships Length to the Weſtward of *South-Sea-Caſtle* that ſtands upon the Beach, then you may luff up without Fear: Being then to the Weſtward of the *Horſe*, and ſteering with that Mark, it will lead you in along the *Horſe* unto the Beach, and ſo into the Harbour of *Portſmouth*, keeping along cloſe by the Shoar, until you come to the Town-wall's-end, and there you muſt bear off a little for a Flat, that lieth off from the Shore; this is for an Eaſterly Wind. But if you intend for *Stokes-Bay*, when you have brought the Fire Beacon on *Brown Down*, which is to the *W N W*. of *Haſlewood* Point within a Ship's length without the ſaid Point, then you may bear to the Weſtwards along the out-ſide of the *Spithead*, which is the Shoal on the Weſt-ſide of the entrance of *Portſmouth* Haven.

If the Wind be Weſterly or Southerly, and you are coming from the Weſtward, and deſign for St. *Hellen*'s Road or *Stokes-Bay*; from *Dunnoſe* to St. *Hellen*'s Point, the Courſe is N. E. by N. and N.N.E. but borrow no nearer to St. *Hellens* than 6 or 7 Fathom, for the *Spit* lies off a great way, but if it be clear Weather, that you may keep *Sand Down* Caſtle open of the *Culver Cliff*, that Mark will lead you without the *Spit* of the Point; ſteer along in this Mark, until you open St. *Hellen*'s Church about two Ship's length open of the *Red Cliff* within St. *Hellen*'s Point or *Port-Sea* Caſtle to the Eaſtwards of *South Sea* Caſtle, then are you clear of the Point, and may ſteer to St. *Hellen*'s Road N W. and having brought the Point S. by W. or between that and the S. by E. you may anchor in 7 or 8 Fathom Water on very good Ground.

Note, That you have no good clear Ground all along the Iſland until you have opened St. *Hellen*'s Church, as aforeſaid, and have brought the Point to bear from you *SSW*.

From St. *Hellen*'s Point, to go between *No Man's Land* and the *Horſe*, the direct Courſe in, is N W. by N. and N W. but you have no ſhoaling upon the *S W.* ſide of *No Man's Land*, for you have 16 Fathom, and the next Caſt but 3; but at the *Horſe* you may ſtand into 10, 9, or 8 Fathom: If the ſtrong Tide be ſpent, and ſmooth Water, you ſhall have a great waſhing of them by the Overfall of the Water; but eſpecially on *No Man's Land*, if it be clear Weather, there are very good Marks to lead you in, which are as follows; keep the two Windmills on the *Downs* on the *Iſle of Wight*, that they may be ſeen clear all over the Trees between you and them, but no more above them than even clear; this Mark will lead you in, and ſo up all along the Iſland without ſome middle Ground that lieth *WSW*. off the Point of *No Man's Land*.

Alſo from St. *Hellen's-point* (if it be clear Weather that you can ſee it) there is a direct Mark, *viz.* a part of an old Caſtle formerly called *Haſlewood* Caſtle, ſtanding on *Gilkeker* Point (which is kept white;) keep *Goſport* Church and that Caſtle in one, or this Caſtle in the middle of the Wood about the Church, which ſheweth with a Valley like a Saddle, and ſo you may run directly in without fear. Or if the Wind be ſo that you are forc'd to turn in, then you may run the ſaid Mark within two Sails breadth of each End of the Wood. In the middle of the Channel is 11 fathom Water; and if you bring the ſaid Mark right under the North End of the Wood you ſhall run in a middle Ground near the *Horſe* that hath not above 10 Foot on it at low Water, and hard Sand.

To ſail within the Wight *in thick Weather*.

To ſail between the *Main* and the *Wight* in thick Weather borrow in 6 fathom off St. *Hellen*'s and ſteer NW by N. and NNW. from St. *Hellen*'s Point, till you have 12 Fathom, and then ſteer more Weſterly, as you find the Depth; come no nearer *No Man's Land* than 9 or 10 fathom; in that Depth you may keep along the *Wight* Side, if the Wind be ſoutherly; but if it be large, keep in 14 or 15 Fathom, which is a good Birth from both ſides, and ſo ſteer *W*. by *S*. and *WSW*. as you find the Depth until you come to *Cows*. *Note*, That being about *Stoak's-bay*, there will be leſs Water, if you go nearer to *Cows*, there you may anchor in 12 or 14 Fathom in the midſt of the Channel, where is good owſey Ground.

Directions for Dover *Road*.

The beſt Ground in *Dover Road* is with the *Whiteway*, to the NW. of *Dover Caſtle*, or between that Hill that comes from St. *James*'s Church, which is a flat Steeple at the North-end of *Dover* Town, for a thwart Mark, and ſo in what Depth you pleaſe, from 12 to 14 Fathom. Thwart of *Foulſton* in 12 or 14 Fathom is very good Ground.

Directions to ſail into the North-Foreland *through the* Gulls *in the Night.*

If your ground Tackle ſhoul fail in the Night riding at the *North-Foreland*, as very often hath happened, and you cannot weather the *Fore-land*, weather the *Northſand-head*; if you can but ſee the *North Foreland* Light, when that Light-houſe bears NW. or NW. by N. then bear over into 8 or 9 Fathom, and being in that Depth (ſteering SSW. (you may be ſure it will carry you directly through with the *Brake*, but keeping your Lead carefully, borrowing no nearer the *Brake* than five Fathom, nor going without nine Fathom, or nine and a half, as you have the Tide under you; this Courſe will lead you through without Danger.

Directions for the North-end of the Goodwin, *for ſuch as ſail from the* North-Foreland *to the Southward in the Night.*

If you be at the *North-Foreland*, bound for the *Downs*, and that the Tides do fall out too early or too late; to turn into the *Downs* with the Wind at *SW.* or *SSW.* take the following Directions.

If it be in the Morning before Day, then be ſure to weigh Anchor in convenient Time, to be at the *Northſand-head* at the turning of the Tide, to the Southward. From the *Foreland* you may ſteer out with a Flood Tide, *SE.* by *E.* and *SE.* or keep the Light of the *North-Foreland*, *NW* by *N.* this Courſe will lead you out. But for the more certainty, be ſure keep the Lead well, and then you may borrow off and on with the foreſaid Winds, in 7 or 8 Fathom, and ſteering out with the foreſaid Courſe, you ſhall find the Depth ſuddenly change to 15 or 20 Fathom; then you may hale up cloſe to the Southward, along the back of the *Goodwin*, the Eaſtermoſt of which lies *S S W.* and *N N E.* 12 or 14 Fathom; and is not above a Saker-ſhot from the Sand. But if it be in the Day Time, and the Wind blows ſo hard that you cannot well tack to run through the *Gulls*, then the Marks to carry you out at the *Northſand-head*, is the flat Church upon the *Foreland* called St. *Peter's*, a Ship's Length to the Northwards of *Broad-ſtairs* Peer head; or borrow upon the Sand by the Lead as aforeſaid, and ſo taking the firſt of the Tide without the Sand, you may ſtand to the South Eaſtwards, till the *South Foreland* bears *W.* by *S.* then caſt about, and you ſhall weather the *Southſand head*, and be in the *Downs*-Road as ſoon as any other Ship that parted with you at the *Foreland*.

Directions for ſailing over the Spits, *the* Wallet, *and by the* Naze *into* Harwich.

Sailing down the *Swin* or *King's-Channel*, and that you would ſail into *Harwich* over the Buoy of the *Spits* into the *Wallet*, you muſt obſerve your Tides, for at the *Spits* the Buoy lieth in 5, 6, or 7 foot Water at low Water; and the Paſſage often alters, ſometimes more Water ſometimes leſs. The Buoy lieth on the Weſt-end of the *Gunfleet* Sand, and the Eaſt-end of the *Baxey*, being from a flat Steeple, called *Great Holland Church*, South and by Eaſt. Being over the *Spits*, you come into the *Wallet*, where is very good Anchoring in 5, 6, 7, or 8 Fathom Water; the Sands lying without, makes it a moſt excellent Road. There is a good and deep Channel to ſail in at the *Wallet*, between the *Gunfleet* and the *Weſt* Rock, but 'tis ſeldom uſed. Being over the *Spits*, in the *Wallet*, ſteer away for the *Naze*, which may be known by the Trees, and a Houſe that ſtandeth on it, keep about half a Mile, or a Mile off from the *Naze*, to avoid the Stone Bank which hath but 5 foot Water on it at low Water; and lieth from the *Naze* Trees E. by N. About a Mile and half from the *Naze* Point, there is about 8 or 9 foot Water between it and the *Naze* at low Water: Keep *Payn*'s Trees that lie a little to the Southward of *Harwich*, open and ſhut with *Harwich Cliff*, and this Mark will carry you on the Stone Banks, and the Trees on the *Corkland*, juſt open of the *Nazeland*, will carry you on the Bank alſo. There is a good leading Mark to carry you between the *Naze* and the Stone Bank, which is *Harwich* Steeple, on *Harwich* Beacon Cliff; and will alſo carry you between the *Pyeſand*, and the Ridge and the *Rowling Ground*, where Ships anchor in 3 and 4 Fathom at low Water. The Mark to anchor in the beſt of the *Rowling-ground*, is to bring *Harwich Windmill* two Sails breadth open of *Harwich-Cliff*: And to ſail from the *Rowling-ground* to the *Nazze*, keep *Payn*'s Trees open of *Harwich-Cliff*, till you bring the *Naze* to bear S. W. then keep *Harwich* Steeple, on the Beacon Cliff, to run within the Stone Bank. There is a Channel to ſail from the *Naze* between the Cork Sand and the Ridge, keeping the *Naze* Trees S. W. ſailing down N E. between the Cork and the Ridge, in 5, 6, and 7 fath. Water. And when you have brought *Harwich* Steeple with the Brewhouſe that lieth to the Northward of *Languard Fort*, then are you clear of the Cork Ledge; this Channel is much uſed by the Light Colliers going to the Northwards.

Being in the *Rowling-grounds*, and that you would ſail into *Harwich* Harbour, keep cloſe by the *Andrews*, which is a Sand that lieth off from *Languard Fort*, and is ſteep too on the Weſt-ſide; The Tide of Ebb runneth ſtrong over the *Andrews* the firſt half Ebb, of which you muſt have a Care. This Sand is dry at low Water; keep cloſe by the Beach of *Languard Fort*, to avoid the *Altar*, which is a ſmall ſtony Shelf that lieth right Weſt from *Languard Fort*, about a Cable and an half's Length from the Beach at the Fort, on which is but 5 and 6 Foot at low Water. You may ſail to the Weſtward of it, between it and *Harwich Cliff*, according as the Tide is up, and what Draught of Water your Ship draweth: but if you ſhould want to go into *Harwich* at low Water, and a Ship draw above 15 Foot, you muſt ſtay for the Flood to have Water over the *Glutton*, which is a narrow Ridge that ſtretcheth off from the Beach thwart the Channel, a little within the Brewhouſe, that is to the Northward of *Languard Fort*: Being paſt the *Glutton*, you muſt keep cloſe to the Beach, to avoid the Griſtle, that lieth in the middle between *Harwich* and the Beach of *Languard Fort*, on which is but three Foot at low Water, there is a ſmall Channel between the Griſtle and the Guard, of 9 Foot at low Water, but when you have opened *Dover* Court Church of *Harwich* Town, then are you clear of the Griſtle and the Guard, and may anchor before the Town of *Harwich*, in 5 fathom Water, to run into *Ipſwich* Water, and anchor; this is a very ſafe Harbour, and if a Ship ſhould chance to blow a-ſhore ſhe cannot take harm, the Shores being ſoft Owſe. The Spring-Tides riſe 15 and 16 Foot, and the Neap-Tides 10 and 11 Foot.

Directions to ſail into Harwich *through the* Sled-way.

Being at the Buoy of the *Spits*, and that you will not ſail over the *Spits*, then keep down by the *Gunfleet Sand*, in 7 or 8 fath. Water, till you come within two Mile of the Buoy of the *Gunfleet*, and then come no nearer than 9 fathom Water, for there lieth off a *Spit*, E. S. E. from the Sand about a Cable's Length; to the Eaſtward of this *Spit* is a ſmall Swatch through the Sand, into which, and *Goldmore*'s *Gat*, the Tide of Flood ſetteth ſtrong into the *Wallet*; of which you muſt have a Care when you come near it, eſpecially in little Winds or Calms, you may be haled on the *Gunfleet-ſand*; this Sand lieth N.E. and S.W. and drieth in ſeveral places: The Buoy of the *Gunfleet* beareth from the Naze SE. by E. Eaſterly; you may ſtand into 7 or 8 Fathom along the ſide of the W. Rock into the *Sledway*, keeping *Balſey Church* N. by W. and N. N. W. till you bring *Harwich* Steeple on the Brewhouſe (that lieth to the Northward of *Languard Fort*) which will carry you clear of the Cork Ledge, on which is two Fathom and a half at low Water, and then ſtand to the Weſtward, and keep *Orford* Church and Caſtle open of *Balſey Church* a Sail's Breadth, till you have the Lights together, keeping them ſo till you are paſt the *Andrews*, and then follow the former Directions for ſailing into *Harwich*: you muſt ſtand in upon the *Flatters* into 3 Fathom, on which Sand is but 2 or 3 Foot at low Water; the Ridge hath 7 Foot at low Water; a great part of the Cork Sand drieth at low Water; and lieth in length N.E. and S.W. about two Miles and a half long, and a Mile broad; Weſt Rocks lie in length N.E. and S.W. about 3 Miles, and 2 Miles broad, and drieth at ſeveral Places, full of Banks and Swatches, the Ground rocky and ſtony in many Places; there is a ſmall narrow Channel between the Weſt Rocks and the Cork.

For the more particular Directions for ſailing into theſe and other Harbours in *England*, *Scotland*, *Holland*, *Normandy*, *Bretagne*, &c. ſee the laſt Edition of the Coaſting-Pilot, newly Corrected and Reprinted for Mr. *Mount* and *Page* on *Tower-Hill*, *London*, with many Additions.

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